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Electrical World

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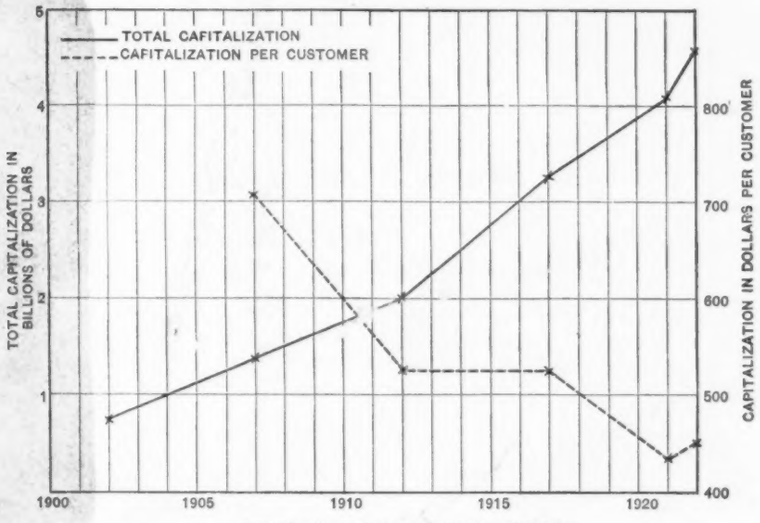

Capitalization of Central Stations Industry

Charging for Electric Service

The First Alternating Current Motor

THE GREAT problem of the central station industry has been to devise a method of measuring and charging for energy that should represent the true cost of service. Way back in 1898, no less a person than Samuel Insull said, "I think this subject is the most important one we have to consider; I devote more of my time to it than to any other one subject connected with our business."

In 1898 measurement with electric meters was the exception. Today the use of meters is universal. An error of 2 per cent in today's meter readings would amount to more annually than 8 per cent on the total capital stock of the central station industry in 1898.

In 1897 work was started in the development of the Sangamo alternating-current meter. In 1899 the company was organized and the first Sangamo meter put on the market. The same men who started this work are still at the helm. They have devoted their lives to the problem of measuring electrical service, providing meters of sustained accuracy for all conditions of use.

Sangamo meters are used throughout the world for many services in which there is no competition, especially in direct-current metering; but their greatest service to the central station industry lies in the effect of Sangamo workmanship and production capacity in raising the quality and lowering the price of all standard alternating-current service meters, of which there are approximately 10,000,000 in use today.

Associated Sangamo Electric Companies

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New York, Saturday, June 10, 1922

Volume 79 *Number* 23

The Way of Understanding

MOST of the irritation, criticism, ill feeling and active antagonism that develops between public utilities and the people whom they serve is the product of a simple human condition of misunderstanding. Such misunderstanding is the natural outgrowth of the fact that John Smith and the utility maintain a living contact which they view from entirely different angles.

The public utility man's mind is naturally focused on providing and maintaining service to the people in the mass and the individual becomes of far less import than "the service." But to John Smith this service rates only with that of the grocer or the milkman, for the utility supplies him with what is now a common necessity of life.

He understands the grocer and the milkman, and what they do for him and how. The utility, however, still remains a mystery, and he is never sure of his own knowledge that they treat him fairly and appreciate his patronage. And so each bit of gossip and each indiscretion on the part of a utility employee he takes as evidence that they do not.

THE cure for all this obviously is to build up understanding. The Pennsylvania Railroad, for instance, has found a way through the menu of its dining-car service that provides an inspiration.

It is a four-page folder that shows first a glimpse of what the engineer sees from his seat in the cab. That grips the interest. Then follows perhaps a little message on "signals and safety," some short word picture of the human side of the railroad. Then comes a clear diagram of the cooking and serving mechanism of the dining car, with facts about the kitchen, the pantry, the food, the water, how the work is handled and the scope of the service. Then come a page of menus and a page of "facts about this railroad."

And as you wait you read. And as you read, you get new understanding of this familiar railroad that you never had before.

WHAT of the human stories that the central station has to tell of the meter, the fuse, the transformer, the transmission lines, the switchboard, the generators, the turbines, the boilers, the load dispatchers, the trouble shooter, the accounting, the sales problem, to say nothing of the motor, the storage battery and the other appliances? Each has its message—little human stories, told man to man in a simple, friendly way.

Suppose such a little human story came to each of us with every bill, marked: *"Put this little folder in your pocket. Read it some time when you are waiting."* Think how much helpful understanding it would bring.

William Spencer Murray

Consulting engineer who was in charge of the New Haven electrification and who caused "superpower" to have a national significance.

THERE are plenty of men who are enthusiasts when the way is clear and the goal is in sight. It takes a different kind of moral fiber, however, to be optimistic and to encourage others when the way is rough and the results are uncertain. This has been one of the outstanding characteristics of W. S. Murray, consulting eengineer, New York City.

Two accomplishments stand out in the career of Mr. Murray. He first came into prominence as the one responsible for making alternating-current heavy traction a fact. More lately, through his connection with the Boston-Washington Superpower Survey as chief engineer, he caused the word "superpower" to attain a significance which it never had before not only with the engineering world but with the general public.

Seventeen years ago Calvert Townley, then acting vice-president of the New York, New Haven & Hartford Railroad in charge of electrification, realizing the need of a man as chief electrical engineer who could do things in a large and courageous way, chose Mr. Murray. In his hands were placed the electrical engineering and construction details of an electrification costing $25,000,000. Later he became consulting engineer for the New Haven road in charge of all features of electrical operation. Thus he was responsible for the construction and operation of the first single-phase electrification of a steam railroad in this country.

During the war Mr. Murray became imbued with the Atlantic seaboard superpower idea and was foremost in attracting favorable attention to the scheme. He was chairman of the committee of the Engineering Council which presented the matter to Congress. When Congress made its appropriation for the work to be conducted under the auspices of the Geological Survey, Dr. George Otis Smith, director of the Geological Survey, promptly selected Mr. Murray as chief engineer of the Superpower Survey, with full authority to go ahead. With his customary vigor and enthusiasm Mr. Murray proceeded to gather around him a staff of experts. In the short period of a year the report was completed. Although the project is of too large proportions to warrant any immediate action, it is a fact that Mr. Murray brought to the nation a fuller and more complete conception of the economic possibilities of large plants properly placed and tied together with a transmission network.

Mr. Murray was born at Annapolis, Md., Aug. 4, 1873, and was graduated from Lehigh University in 1895 with the degree of electrical engineer. The next seven years he spent with the Westinghouse Electric & Manufacturing Company in several departments, after which he opened a consulting engineering office in Boston. Then came his work on the New Haven electrification. While still engaged in this work in 1913 he formed a partnership in consulting engineering with E. H. McHenry, formerly a vice-president of the New Haven railroad. In 1917 he became president of the Housatonic Power Company and chief engineer of the Connecticut Power Company. In 1919 he returned to the consulting end of his profession, and he is now senior member of the partnership of Murray & Flood.

In association work Mr. Murray has been quite active. He has served on numerous committees and presented many papers. He has served as manager of the American Institute of Electrical Engineers, and was a vice-president of that body from 1912 to 1914.

Editorial Comment

Electrical World, June 10, 1922

Volume 79 Number 23

The War Tax Burden to Be Balanced

AS WE read the newspapers these days it is a fine thing to realize that the fast-unfolding confidence and increasing business activity which are reflected on all sides have been achieved in spite of conditions that might well have been looked upon as permanently blighting influences. Through the recent years possibly 20 per cent of our entire national production has gone into taxation. Rents and wages are thereby increased. The cost of production is raised some 25 per cent by the added carrying cost of the losses imposed by the war, and we must go along with it. In addition, we have suffered the shock of a 20 per cent depreciation in the value of our entire stock of goods within a period of eighteen months. And yet, almost paradoxically, there is today a well-founded business optimism on every side.

Business is better, but we must remember that there are some very definite handicaps yet to be overcome. We have in America a high degree of efficiency in individual activity, but a low efficiency in co-operation between different industries and within the trades. Here, however, lies the one promising opportunity to take advantage of the returning era of prosperity to balance the heavier burden of taxation by an improvement in our costs of distribution. By the elimination of waste in production, by the electrification of our transportation lines and factories and by a closer co-operation between the different agents of distribution, we must more fully restore the economic balance and make the products of our work mean what they did before the war.

There is no problem before American business men more vital than this. We may have come whole through our trials and tribulations. Better business health may be encouraging us to happiness once more. But until we absorb this increased tax burden by increased production efficiency we can hardly feel content.

Competition Has No Place in the Electric Light and Power Business

THE fundamentally and rightfully non-competitive character of the electric light and power business under government regulation has received a fresh confirmation in the decision of the United States Circuit Court of Appeals sitting at Richmond, Va., that the Southern Power Company must supply hydro-electric energy to the North Carolina Public Service Company on the same terms as to its other customers, even though the latter be its own subsidiaries. The Southern Power Company set up in its defense the well-established principle that no one is bound to help a rival to his own detriment. The North Carolina company maintained that it would be forced to discontinue service in two towns if the defendant company were permitted to refuse to sell energy to it on the same terms as to others and fought against the destruction of its business by a competitor in the field.

When the state steps in to regulate public utilities, it, by implication, guarantees to each secure possession of the territory that its franchise covers so long as it renders adequate and faithful service. This guarantee, which applies alike to generating and to distributing companies, is not the least of the benefits that spring from commission rule.

Public Service Commissions Have Come to Stay

EVIDENTLY the movement headed by the redoubtable Mayor Shank of Indianapolis for the abolition of the Public Service Commission of Indiana did not, after all, arouse great popular enthusiasm, in spite of the strong political support accorded to it, for news comes that the Mayor and the Governor of the state, who is opposed to doing away with the regulating body, have agreed on a program of amendments to the commission law which will take the place of the radical program previously championed by the Mayor and his followers. It will be remembered that a similar agitation swept the neighboring state of Illinois a year or two ago, and that in accordance with what appeared to be the voters' mandate the old Public Utilities Commission of that state was legislated out of being. It was, however, at once replaced by the Illinois Commerce Commission, in which were vested powers of the same kind as those possessed by its predecessor and which functions in the same manner as did the antecedent body. The fact is that the principle on which public service commissions are based has become too firmly rooted to be easily destroyed, and that the abolition of any existing body is likely to be followed by the creation of another in much the same image.

Now, although a commission by any other name will probably work as well, constant assaults, we do not mean on personnel, for such attacks are part of democratic government, but on the foundation upon which commissions are reared and the time-tested theories which they exemplify, are disturbing and may become demoralizing. May it not be that as public education in this matter progresses many states will sooner or later find the way to its permanent basic adjustment by writing, as Oklahoma did, a public service commission, with prescribed duties and procedure, into the constitution of the commonwealth? The commission would then cease to be a mere creature of the legislature and become a part of the organic law of the state, like the executive and the courts. Its members, whether elected or appointed, would no more than now be immune from public criticism; if guilty of malversation, they could be reached in their own persons or through the governor who appointed them; they would not be secure against removal or impeachment. But the commission itself—the body as distinct from the men—would be protected against injury and threatened destruction from every wind that blows without knowing whither it listeth.

Radio May Now Contribute Central-Station Revenue

WITH the production and sale of electron tubes for use with radio sets already reaching 300,000 a month, the new prospect of energizing these tubes directly from the lighting socket makes the subject of radio of even greater interest to the central-station company. As is described elsewhere in this issue, the Bureau of Standards has devised a way to dispense with the storage battery hitherto required for the vacuum tube and to substitute a direct connection to the 60-cycle circuits through a lamp socket. In short, radio becomes by this means a household energy-consuming appliance that offers a possible new source of revenue in something like a million homes throughout the country.

The most perplexing problem of the radio boom has been the question of how to finance the cost of broadcasting through revenue to be obtained from the receiving station that enjoys the service. So far no way has been found. Interesting possibilities are suggested, however, through the combining of carrier-current broadcasting over the lighting lines, as is now being done experimentally by General Squier in Washington, and this new use of central-station power in place of storage batteries. The consumption of energy by the receiving set, plugged into the nearest socket, would automatically provide a revenue directly creditable to broadcasting, perhaps enough to finance it. Who knows? It would depend entirely on the number of connected sets, and that number is already great and growing.

There are no end of questions that can be asked, of course. Radio still is in large part a vision, as to which each may make his guess. How broadcasting will trend and what part wired wireless will play in it we cannot say. Perhaps the telephone system will prove the most effective conductor, perhaps the power system. All this lies in the still unfolded future. But meanwhile it is worth watching and thinking about. That the central station has a part to play in it is hard to doubt.

Reactor-Type Circuit Breakers Deserve Investigation

FROM time to time there crops up the suggestion of a switch or circuit breaker shunted with resistance or reactance, the breaker being also equipped with additional contacts for finally opening the shunt circuit. The obvious principle is that when opening the main contacts the reactance lowers the resulting load, which may then be safely opened on the auxiliary contacts. The suggestion is a very old one and from time to time has been used in practice. Switches of this character were employed in connection with one of the important early electrical developments at Niagara. The principle is sound as applied to loads up to the rating of a circuit breaker, in that the maximum demand upon both breaker contacts and reactance is known. The use of the reactor thus permits the use of a smaller capacity of breaker. Breakers of this type have been used to some extent abroad, but in this country operators have preferred to avoid the complication caused by the reactor connections by using larger breakers without reactance.

Experiments investigating the effectiveness of the shunt device would be well worth carrying out. There would appear to be considerable doubt whether the time interval involved in the transference of a short-circuit current, which must have attained considerable proportions before the main contacts open, to the shunt reactor circuit would not materially reduce the value of the device when applied for this purpose.

Alabama Power Leads the Way in Hydro-Electric Plant Design

SOME rather revolutionary innovations are being made in the new Mitchell Dam plant of the Alabama Power Company on the Coosa River which hold great promise of solving two outstanding problems in hydro-electric development. The chief departures from conventional practice are the semi-outdoor construction, the backwater suppressor and the position of the turbines. The suppressor, as explained elsewhere in this issue by J. A. Sirnit, depends essentially on the energy of a sheet of water flowing over the down-stream face of a dam of ogee section to sweep the backwater away from the foot and thus increase the effective head on the turbines. To utilize this effect it has been necessary to mount the units on separate foundations distributed across the up-stream face of the dam.

The success of the suppressor depends on the assumption that sufficient water will be available during flood season to make a marked decrease in the elevation of the tailwater without robbing the turbines. Prior to its adoption in the Mitchell Dam plant, O. G. Thurlow, chief engineer of the company, who is responsible for the idea and its development, constructed two experimental installations. The data on the larger of the two installations show, with the suppressor in use, an increase in head of over 30 per cent under some conditions. Such a result will justify a considerable expenditure of money, though in this case the statement is made that the installation will actually cost less than the ordinary type of hydro-electric plant. The experiment will be watched with a great deal of interest since it offers a way of making practical many developments that might not be feasible otherwise because of severe back-water conditions during flood season.

The plant will be notable not only for this hydraulic feature but because the company has had the courage to put into its design important modifications in the type of building. The usual imposing structure is omitted, and the generators are covered with low buildings having roofs so designed that they can be removed and any part or all of the equipment taken out by use of a gantry crane which serves the entire power-house section. The design is a decided step in the direction of the outdoor generating plants that have been discussed rather seriously in the last few years. The trend of the times is steadily away from the "frills" that have been largely conventionalized in plant and substation construction, probably because the first developments of the industry were made under conditions requiring construction common in other industries.

If a departure from the conventional will result in reduced cost of service without lowering of service standards, those having the courage to make the break are entitled to congratulation and the help of the industry. While some will be found to delight in criticism of the innovations that are being made in this case, the majority will hope sincerely that the designs will completely fulfill the expectations of the designers. Because of the careful studies that have been carried out there seems to be no good reason to expect otherwise.

Top Dimensions of Wooden Poles Mean Nothing

THAT the use of the top diameter in designating the size of a wooden pole means nothing is one of the interesting facts that have come out of the recent discussions of the pole situation. The practice was adopted at a time when there was less demand for poles and when fewer kinds of wood were used, which were apparently available in unlimited quantities. The real practical measure of the strength of a pole is its dimensions at the ground line. In addition a limiting dimension can be put on the top to prevent the shipping of poles that have an excessive taper. The taper of many poles now available is such that the specification of a seven-inch or an eight-inch top without any other limiting dimension can easily mean a very inadequate ground-line dimension.

It will be well for those who are concerned with the buying of poles to carry this fact in mind and also to study carefully the new pole specifications that have been prepared by the overhead-systems committee of the National Electric Light Association. Owing to the depletion of the supply of wooden poles there is apparent need of a change in some of the practices of the past, and the new specification is a move toward that end. There is yet time to suggest changes if experience shows any need for them.

Maintain the Supply of Trained Research Men

UNTIL very recent times relatively small numbers of men have devoted their principal efforts to research, and the reason has probably lain in the absence of a sufficient stimulus. The rewards even of successful research have not been of a material nature, and those men who have devoted the principal efforts of their lives to investigation have often done so at great personal sacrifice, having been impelled rather by an inward realization of the glory attaching to service rendered to succeeding generations and by the fascination in the successive steps and problems of journeys of discovery into new fields.

Lately, however, the situation has changed markedly. The products of research now have a distinctly marketable value. In fact, it may be said that the bread cast upon the waters by the succession of earlier workers is now returning, approving the ideals of these early workers and showing the world the importance of continuing study and investigation. The value of research is now emphasized on every hand and especially in the fields related to engineering. Not only do our educational institutions have research divisions and experiment stations and our governmental bureaus devote a large part of their effort to research, but our industries are spending enormous sums of money and our national engineering societies are uniting in a common effort for the extension of the work of research.

The immediate result of this modern recognition of the importance of research is a greatly increased demand for trained investigators. Experienced men in this field may now command salaries which compare favorably with, and in some cases even exceed, those in other branches of engineering endeavor. The demand is also clearly indicated by the eagerness with which the better grade of engineering graduate is absorbed into the research divisions of the great electrical industries.

There is, however, a serious danger to the future progress of research in this insistent demand for men. The danger is, first, the exhaustion of the sources of supply and, second, the want of realization of the importance of the complete training of research workers. The university laboratories are the natural training schools for men in this field. There are numerous instances in which the attraction of a well-paid position in an industrial laboratory has caused a useful and inspiring teacher to leave the training laboratory. Furthermore, the demand for young men in other phases of engineering activity causes the vast majority of them to leave college at the end of the four-year undergraduate course. The effect of this on the quality of the product available for the field of research is twofold—first, it diverts to other fields many young men who would make successful investigators, and, second, even if some of these young men are drawn into the research field, they are not sufficiently trained to become investigators of the first rank.

It would appear that the engineering professions and industry should in some way look to the conservation and improvement of the sources of supply of trained investigators. This could be done by supporting research work in colleges and universities and by encouraging young men to continue into graduate years of study. If industry demands the highest grade of investigators, why should not industry demand also a doctor's degree for its own laboratory staff? But industry cannot expect a young man to assume the burden of the exacting effort and expense of three or four years of graduate training unless it renders him some assistance. The methods are relatively easy and the cost would not be great. Graduate scholarships, fellowships and, best of all, professorships in special fields founded and endowed by a united industry would be an ideal solution.

Use of Secondary Racks Needs Supervision

THE use of secondary racks for distribution construction has attracted a great deal of attention from distribution engineers because of the possibility that by their employment better and cheaper construction can be attained. It is not to be denied that some of the work done in this way has been cheaper in cost than construction of other kinds, but in certain cases it has been less desirable because it has brought an increase in hazards. This has been largely due to the practice, time-honored in the distribution field, of turning the job over to the line foreman or even leaving it to the judgment of the individual lineman, without any engineering consideration as to how the racks should be used. Like every other form of construction, the rack has its problems and limitations. There are many places where the use of cross-arms is better, as, for instance, where there are a number of secondary circuits on the same pole. This should be clearly recognized, and the distribution engineer who has the problem to face can then settle down to a study of the way in which the racks should be utilized and the methods of installation that will give the best results. A study of this kind is presented elsewhere in this issue by L. C. Peterman, whose paper is based on the use of rack construction at Chillicothe, Ohio. Such studies point the way toward further investigation that can be undertaken with considerable benefit.

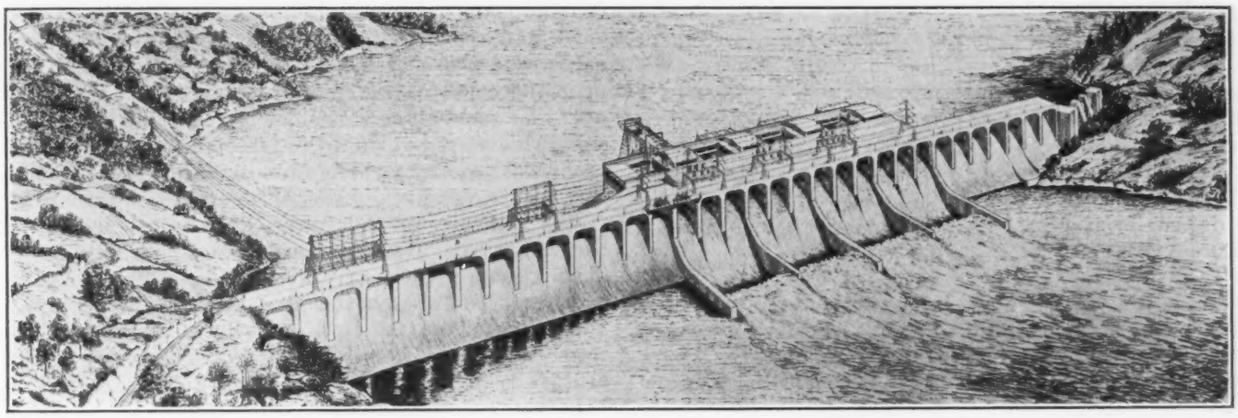
A Measure of Civic Pride

NEW ORLEANS, the meeting place of the recent Knights Templars' triennial conclave, delights to turn conventions into gala occasions, in which electrical decoration plays no small part. Not every city and town can attract national conventions, but in all of them there are numerous events of local import where decorative lighting would add to the festivity.

Semi-Outdoor Hydro-Electric Plant with Backwater Suppressor

Mitchell Dam Development of the Alabama Power Company Will Involve an Entirely New Principle in Hydro-Electric Construction —Results of Long Series of Experiments in Backwater Suppression

By JOHN A. SIRNIT
Designing and Electrical Engineer Alabama Power Company



WITH the demand for more and cheaper power caused by the rapid development of the country, and with the increasing cost of steam power, greater interest in water-power development is being shown in all parts of the nation. In this country as abroad hydro-electric developments are being made on a scale never attempted before, and plants are being built and generating units are being installed in sizes that would have been astonishing a short while ago. Just as a designer of steam plants endeavors to produce as much power as possible out of a pound of coal, so the designer of hydro-electric plants is anxious to utilize every drop of water and convert it into useful power with a minimum amount of loss and at the least cost. The designers of waterwheels and turbines have helped a great deal by improving the efficiency of the driving machinery, and the designers of generators have done likewise.

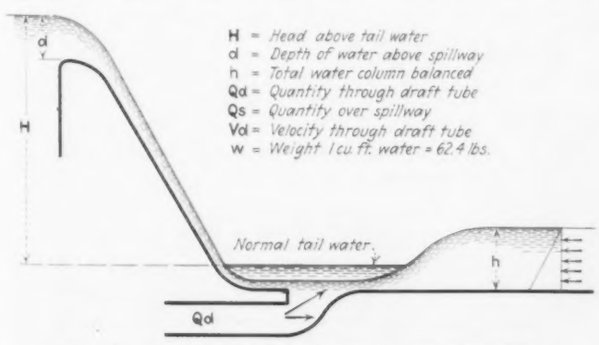

H = Head above tail water
d = Depth of water above spillway
h = Total water column balanced
Qd = Quantity through draft tube
Qs = Quantity over spillway
Vd = Velocity through draft tube
w = Weight 1 cu. ft. water = 62.4 lbs.
d
H
Normal tail water
h
Qd

FIG. 1—DIAGRAM SHOWING ACTION OF OVERFLOW SPILLWAY WATER ON THE TAILWATER

In many cases of proposed developments engineers have hesitated to recommend the carrying out of a project on account of backwater conditions in the tail-race. These can be predicted very closely. The proposed development at Great Falls on the Potomac River, which has been under discussion for many years, is an example in point. Engineers have wrestled with this problem for many years, and have tried to overcome the difficulty by installing a greater number of generating units, where it was possible to do so, to compensate for the loss in capacity in each unit. Such a procedure, of course, necessarily makes the installation more expensive, with a resulting increase of production costs. Attempts have also been made to counteract this loss in head by admitting water into the draft tube through jets at a relatively high velocity. Thus, by accelerating the velocity of the combined turbine discharge and the jet water through the draft tube, a negative head will be produced and added to the head of the turbine. A number of variations in the place and manner of introducing this jet into

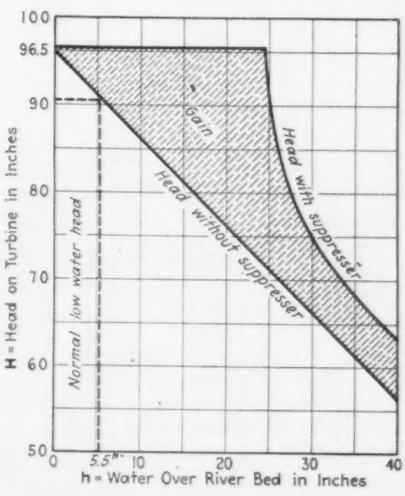
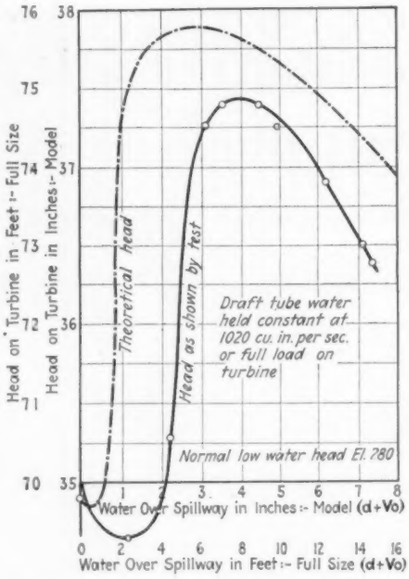


FIG. 2—CURVES SHOWING TURBINE HEAD WITH AND WITHOUT THE BACKWATER SUPPRESSOR

the draft tube have been tried and the results published, but these results have not been entirely satisfactory. It would appear that the most logical and simplest way to maintain the normal head on the waterwheel and thereby the full capacity of the plant during flood periods, is to remove the high tailwater from the discharge opening. O. G. Thurlow, chief engineer of the Alabama Power Company, attacked this problem in a large way and has succeeded in arriving at a successful solution. The development of this conception involves the utilization of the waste water and has resulted in what is known as the Thurlow backwater suppressor.


Head on Turbine in Feet :- Full Size
Head on Turbine in Inches :- Model
Theoretical head
Head as shown by test
Draft tube water held constant at 1020 cu. in. per sec. or full load on turbine
Normal low water head El. 280
Water Over Spillway in Inches :- Model (d+Vo)
Water Over Spillway in Feet :- Full Size (d+Vo)

F.G. 3—THE EFFECT ON THE TURBINE HEAD OF DIFFERENT AMOUNTS OF WATER OVER SPILLWAY

It is a well-known phenomenon of nature that water flowing over a masonry dam having a down-stream face of ogee section leaves the apron in a thin sheet at high velocity. At a point below the dam the water arises turbulently, forming a so-called "standing wave," "hydraulic jump" or "back roll." The thickness of this sheet and the velocity of the water depend upon the height and shape of the down-stream face of the dam, upon the depth of water at the crest of the dam, and upon the quantity of water flowing over the dam. The energy developed in this thin sheet of water has generally been regarded heretofore as solely of a destructive nature, but in the backwater suppressor the energy of the spillway water is directed so as to remove the backwater from over the draft-tube orifice, sweeping it down stream and thus freeing the draft tube from the pressure of water over it and maintaining a practically uniform head on the turbine as long as the spillway water is able to sweep the backwater away from the draft-tube orifices.

TABLE I—COMPARISON BETWEEN CALCULATED AND OBSERVED HEADS OF BACKWATER

EAST LAKE MODEL

d (Inches)	(Observed h Inches)	(Calculated h Inches)
4	6.00	6.5
5	7.75	8.05
6	8.75	8.9
7	9.75	10.0
7.5	11.00	10.6

JACKSON SHOALS MODEL

d (Feet)	(Observed h Feet, Corrected)	(Calculated h Feet)
0.25	0.40	0.59
0.50	0.84	0.88
0.75	1.30	1.20
1.00	1.51	1.56
1.25	1.72	1.78
1.50	2.10	2.08
1.75	2.48	2.35

In Fig. 1 is shown diagrammatically the action of the overflow spillway water on the tailwater. It is shown among other features that the energy of the spillway water not only removes the height of tailwater from the draft-tube orifice but even lowers the normal tailwater level to a level that can be predetermined.

In order to substantiate the idea and evolve a definite theory on which to base calculations a model was constructed on a scale of one in twenty-four at East Lake in Birmingham, Ala., where a small flow at 3-ft. (0.9-m.) head was available. The results obtained here were so interesting that, in order to check the data obtained and to increase the accuracy of measurements, a second and larger model was constructed to a scale of one in ten at Jackson Shoals, Ala., where a greater flow and head were available. The results obtained with the two models, when re-

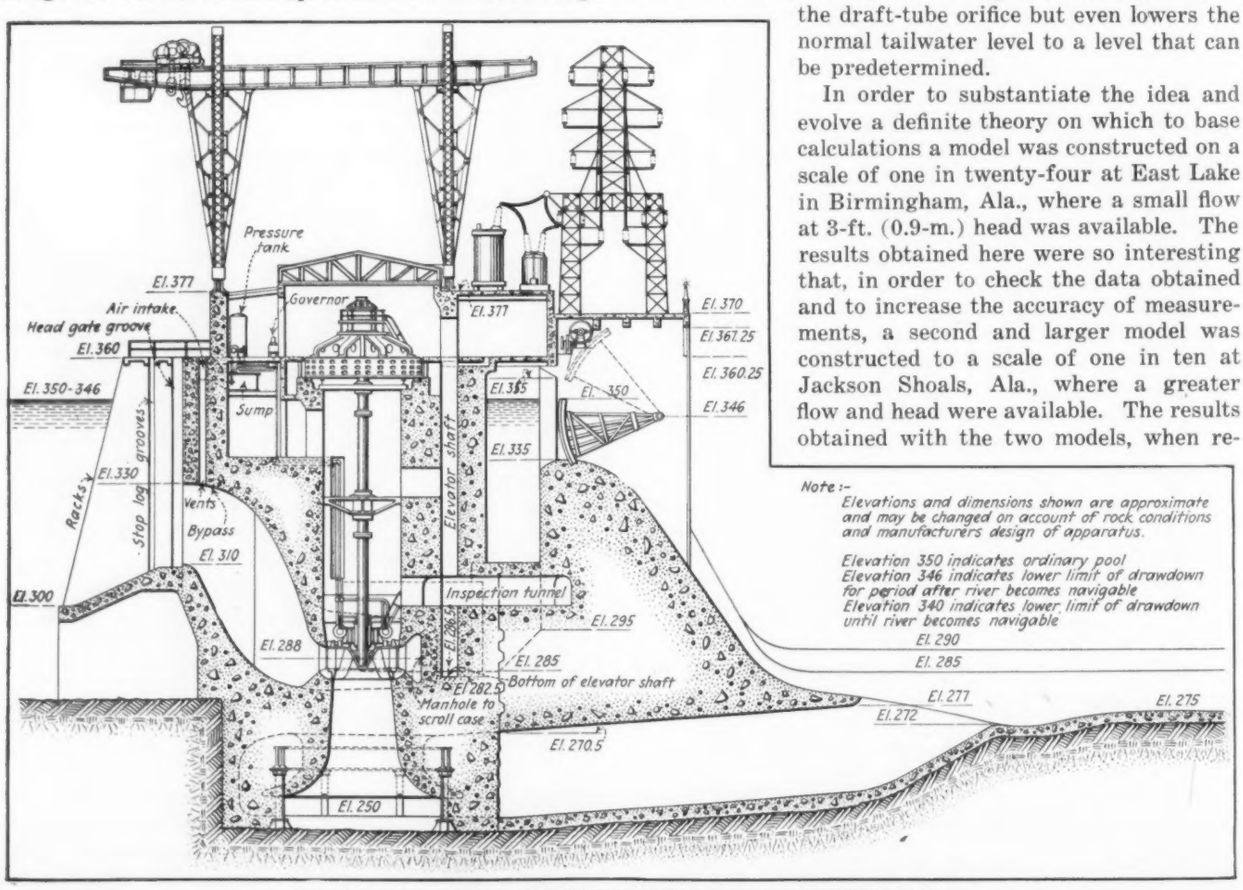


FIG. 4—CROSS-SECTION THROUGH POWER HOUSE AT MITCHELL DAM

TABLE II—PERFORMANCE OF JACKSON SHOALS MODEL

Water Over Riverbed, in Inches	Head Without Suppressor, in Inches	Head With Suppressor in Inches
0	96	
0.50	95.50	96.50
2.75	95.75	95.75
19	77	96.75
20.75	75.75	96.50
21.50	74.50	97
22	74	96.50
22.50	73.75	96.75
22.75	73.25	96.75
23.75	72.75	96.50
24.50	71.75	89.50
24.75	71.75	88
26	70	87
27.50	68.50	80
29	67	73
29.75	66.75	74
30.75	65.75	73
34	62	68.75
35.75	60.75	66
40.50	55.50	66.75
46	50	56.50

duced to the same scale, were in close agreement and the observed results followed those calculated for similar conditions.

The height of the standing wave, taking a section of unit (1-ft.) width and neglecting losses due to the friction of the moving water over the spillway, can be approximated by the empirical formula $h = \sqrt{d^3} \times \sqrt{H}$, in which d is depth of water in feet over the spillway and H head in feet above spillway apron. This does not take into account the effect of the turbine water. This factor will increase the height of the standing wave, so that the actual results will be somewhat better than those shown by this formula. A comparison between the calculated and observed heads of backwater which different amounts passing over the spillway are capable of removing from the draft-tube orifice is given in Table I. These figures are for a section of backwater 20 per cent greater in width than the spillway, using the formula, $h = \sqrt{0.83d^3} \times \sqrt{H}$.

The figures in Table II, compiled from three separate tests made at different times, show the performance of the Jackson Shoals model with 18 in. (45-cm.) of water over the spillway in suppressing various heads of backwater. These readings are illustrated in Fig. 2, which shows curves of the turbine head with and without the backwater suppressor and is typical of the performance of the suppressor with a normal thickness of water over the spillway and varying heads of backwater.

The effect on the turbine head of different amounts of water over the spillway is shown by the curve in Fig. 3 (East Lake model). It will be noted that very small amounts cause a decrease in head because sufficient velocity has not been given to the draft-tube water to cause a thinning of the sheet over the draft-tube orifice, but when the ratio of spillway to draft-tube water increases to about one to one the curve takes a decided course upward, reaches its peak and starts falling off again, owing to a greater quantity of water passing over the orifice with virtually no increase in velocity above that of the point of maximum head. This curve does not represent the best performance possible, but it is typical of the ideal theoretical curve which is shown in the figure.

DESIGN OF THE POWER PLANT AT MITCHELL DAM USING BACKWATER SUPPRESSOR

Encouraged by the splendid results of the model tests and substantiated by careful studies of the benefits involved, the Alabama Power Company decided to apply the backwater suppressor at Mitchell Dam on Coosa River, Ala., which is now under construction; but before this decision was made a careful analysis was prepared to determine the economic advantages of this innovation.

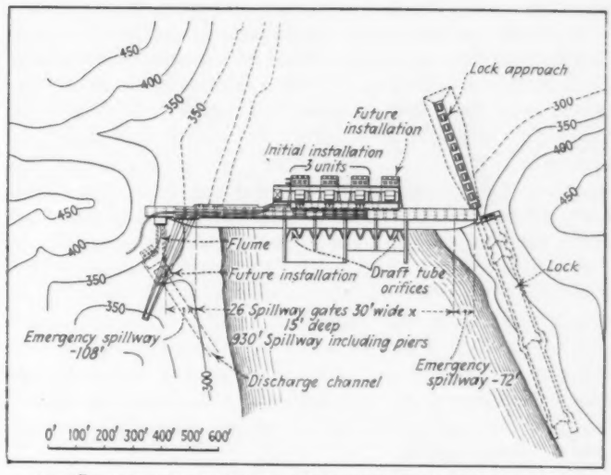


FIG. 5—GENERAL PLAN OF MITCHELL DAM POWER PLANT, ON COOSA RIVER, ALABAMA

Being satisfied that the backwater suppressor will perform as indicated by the tests, the next logical question would be, Will the suppressor-type power plant cost more to build than the conventional type of equal abilities, and if so, how much more? If the cost is higher than that for a plant of conventional design with an equal output, or even if the cost is the same in both cases, the conventional type of power plant would be preferred, because in a new and untried design things will always be found that may not work out as predicted, while the conventional type of plant has already proved its worth.

The estimates, however, not only showed that the cost of the suppressor-type plant was not higher than that of a conventional plant with equal output, but it showed even lower cost for the same number of units, which, of course, meant that for a given output the suppressor-type plant was considerably lower in cost.

The design finally evolved for the Mitchell Dam power plant with the backwater suppressor shows several radical changes and represents an entire departure from the established conventional design of hydro-electric power plants. Fig. 5 shows the general plan at this development. Fig. 4 shows a cross-section through the power house. The salient points of interest, especially those departing from time-honored practice, are many, but only the more important ones will be outlined.

The principal and outstanding feature in this plant is the location of the power units on separate foundations in the river on the up-stream side of the dam. Although this is not necessarily the only possible way to build the power house, in this particular instance it was the most economical. The river at this point being comparatively narrow, the entire length of the dam was required for spillway, and since the prime requisite of this type of plant is that the draft tube shall discharge directly under the spillway section, the units were to be so located that they would not obstruct any part of the spillway section.

The individual and separate power-house units offer the added advantage that trash racks do not present a solid front, which helps materially in cleaning them and affords an easy and convenient way of diverting

the trash past the power house and over the spillway. The usual power-house building is entirely eliminated, and the generator room is covered with a low roof, which is designed in two sections, joined on the transverse line and mounted on rollers, the sections moving in opposite directions. In normal operation the generator room is completely protected from the weather, but if access is required for handling heavy parts of the machinery, this roof can be opened and all parts handled through that opening with the crane.

A single gantry crane with full travel over the entire length of the power-house section is so designed that everything, with the exception of the spillway gates, can be handled with its aid. It is equipped with one 125-ton and one 20-ton hook, the former for handling heavy machinery and the latter for raising and lowering penstock gates, handling racks, stop logs and all other lighter parts.

An outdoor-transformer and high-voltage switching station is located on the bridge over the spillway. It should be mentioned in this connection that this plant is designed for operation on the unit system; that is, the generator and its bank of step-up transformers are connected as a unit and all principal switching is to be done with the high-voltage circuit breakers. In stations where units are of large capacity, as in the plant under discussion, where they are rated at 20,000 kva., the unit system is very economical and is preferable, as it presents the simplest, and yet a sufficiently flexible, form of operation.

The entire operating floor is on one floor level—the generators, governors, switchboards, low-tension switches, bus galleries and offices are easily reached without climbing stairs. This materially adds to the convenience of operators and makes the supervision and inspection of the plant more effective. It should be mentioned that the provision of easy accessibility to all important parts of the station is frequently lost sight of by the designer, and this lack of convenience has been the cause of inefficient operation or even breakdowns caused by neglect.

The generators are so installed that the hot air from the generator is discharged into a separate compartment under the main floor and in summertime is expelled into the atmosphere through side openings in the room, thereby keeping the place reasonably cool. In winter, however, when heat in the rooms is desired, the outside openings can be closed and registers in the floor of the generator room opened, letting the warm air in. The penstock is not a true scroll casing, but rather a combination of scroll effect and open flume.

Although little has been said here about the electrical features of the plant, that part of the installation is one of its most important points and has received the closest study in the interest of economical and efficient operation.

Building Advertising on the Foundation of a Common Interest

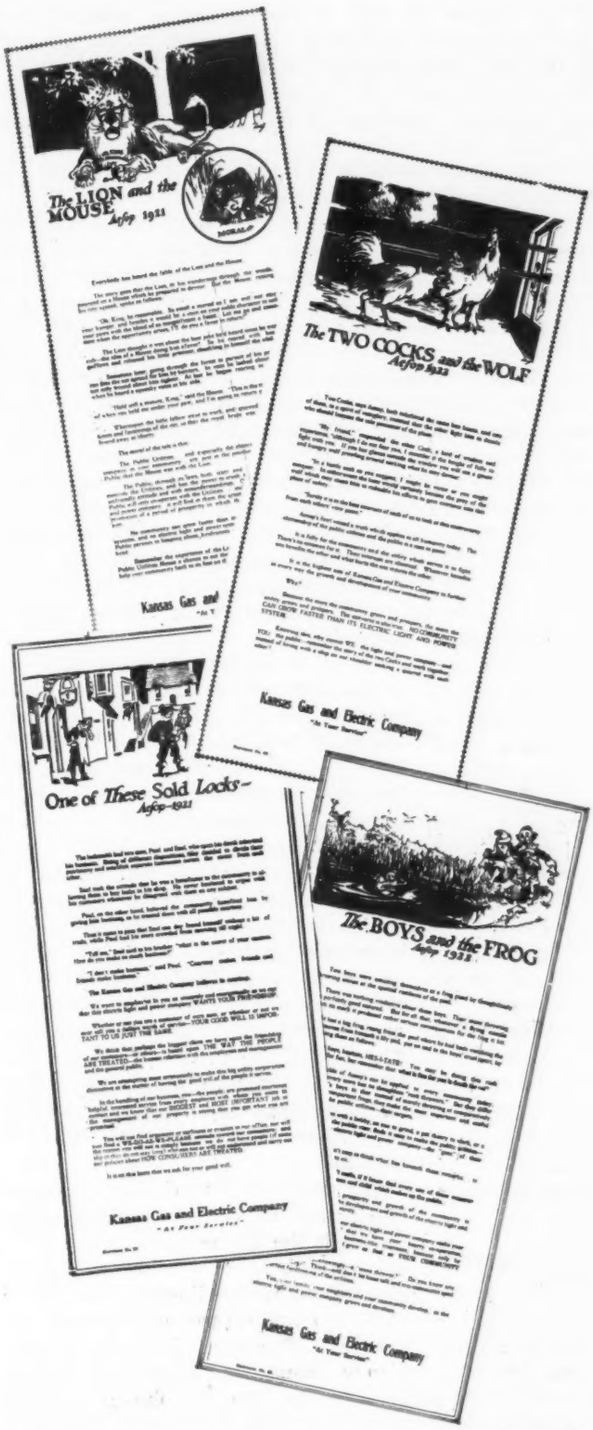
A Campaign of Good-Will Advertisements Featured in Kansas—Written Around Aesop's Fables, These Appeals to the Public Have Aroused Wide Interest in Two States Among Those Who Would Not Read Business Data

THERE is often a tendency on the part of the inexperienced advertiser to tell a story in his advertising that appeals to him personally. Such an appeal is based on a knowledge of the business he is talking about, which has been gained over a long period of time, and is needed as a background against which to understand and appreciate the advertising. As a matter of fact, most advertising to the general public must be written on the assumption that the individual to be reached does not understand the subject matter at all, and the appeal must be first through the medium of something that fits his habits of thought, and through which the message to be conveyed can be pressed home. It is a lamentable fact that much money is wasted in public utility advertising by failure to observe these elementary rules.

What will appeal to one community may not appeal to another because of local conditions, but underlying any successful advertising are principles that can be applied everywhere. Such a principle is well illustrated in a recent series of advertisements used by the Kansas Gas & Electric Company which are based on the common knowledge of Æsop's fables and their popularity. They have occasioned a very large amount of varied and extremely interesting comment in that state and in a neighboring state as well. Some of this comment has been decidedly critical, more has been favorable, and a recent investigation in several communities where the series has been used indicated that the public, at first indifferent to the advertisements, has come to look for each succeeding one with eager interest. Inquiry of several newspaper men indicated a unanimous opinion that the message has been getting across.

The real fascination about the advertisements lies in the use made of the fables. Perhaps no type of stories are so universally known as Æsop's fables, the rhymes of Mother Goose and the old fairy stories. They strike a chord that awakens childhood memories, and incidentally they drive home in a forceful way the most important lessons a human being can learn. So it is safe to say that there are few men, no matter how busy, who will not pause a moment to see what use the fable is put to. In this series, a few of which are reproduced here, the stories are cleverly and forcefully used to tell the utility story in words that even the children can grasp.

To the banker or the utility man who has been trained to think in dollars and cents, or in terms of the balance sheet only, the story may not appeal, because it does not tell the facts he wants to know. Unfortunately for thinkers of that type, they are numerically very much in a minority. The story they are interested in goes over the heads of the vast majority. Balance sheets do not interest the general public.



A SERIES OF SIXTY OF THESE UTILITY ADVERTISEMENTS HAS AROUSED GREAT INTEREST AMONG THE PEOPLE OF KANSAS

The fact that a utility needs money to give service is of no interest until the service fails to materialize, and then it is too late. But the fact that the utility has a definite relation to the community welfare is a matter with which every one is concerned. If this fact can be "put across," the other facts need not cause worry, for they will take care of themselves.

The accompanying illustration shows the general appearance of these advertisements. The following is a good example of the "copy" appeal and shows how the moral of the fable is tied to the utility business:

THE OLD MAN AND THE STICKS

Of course you have heard Æsop's story of the Old Man with the quarreling sons.

Time after time he had tried to persuade them that this was sure to end in disaster for them, but to no avail. At length he decided to try something else.

Gathering a quantity of small sticks, he made them into a tight bundle, and then handed it to his sons, telling them to try to break the bundle. In vain they strained, one after another, in their attempts—not one of them could break it.

Seeing that they were unable to perform the feat, the Old Man at length took the bundle to pieces and gave each a small stick to see if he could break that.

"Why that's child's play," they said, as each snapped with ease the twig handed to him.

Then the Old Man said: "My sons, I wanted to show you how much more powerful you would be if you would stick together like brothers instead of wrangling like beasts."

So thoroughly did the ancients understand the truth of the old phrase "In union there is strength" that the Fasces—a bundle of sticks bound together—was the official symbol of the Roman Empire.

What the ancients discovered remains true today.

"Blood brothers" cannot fight and quarrel among themselves without bringing to themselves sure and swift disaster.

So closely interwoven into the business and home life of the community is the electric light and power company that the COMMUNITY and the COMPANY are nothing more or less than "blood brothers."

How foolish, how silly, how UNBUSINESSLIKE for them to quarrel!

The great and powerful enemy to these two "blood brothers" is HARD TIMES. If they would bring prosperity into partnership and kick hard times out the back door, these two—the light and power company and the community—must stand together as brothers should.

No community is any bigger or better than its electric system.

No electric system is any bigger or better than the community.

In a word, then, the COMMUNITY and the COMPANY are dependent upon each other for prosperity. Like the boys in the fable, they should learn the great truth that co-operation brings success.

KANSAS GAS & ELECTRIC COMPANY

"At Your Service"

The story of the utility's place in the scheme of community affairs is forcefully set forth in this series by a careful tying of each of the fables to a vital utility fact and the pointing of the moral in a few simple sentences. No knowledge of the utility business is needed to understand the application of the fable, and there is no table of complicated financial data that the average citizen is only too ready to dodge because of lack of understanding of their significance. The series included about sixty advertisements. They undoubtedly would not fit all localities, but the plan on which they are constructed makes them a valuable study for the man who must handle central-station advertising.

Advertising, of course, has but one object—that of telling a story to the individual it is desired to reach so effectively as to leave an impression on him that will either induce him to buy something or take some sort of action that will be of benefit to the advertiser. Consequently successful advertising is that which accomplishes the result, and in the preparation of advertising copy a real knowledge and consideration of the habits of thought of the individuals that are to be reached is inevitably involved.

The first requisite is absolute honesty and reliability on the part of the advertiser. No advertising, no mat-

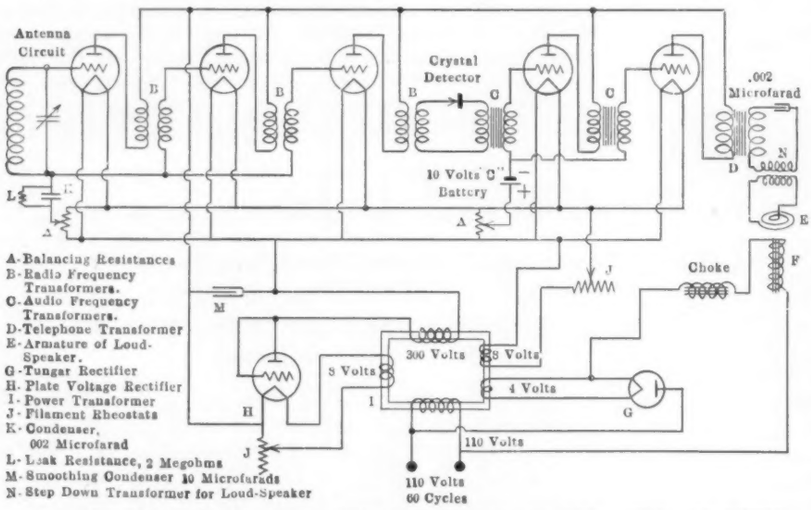
ter how good, can be effective for long unless it is backed to the limit. Another factor in public utility advertising that must be considered is the influence of the contact between employees and the public. Absolute honesty and reliability may back the advertising, yet if employees are not educated to meet the public courteously and with an evident desire to render service, much, if not all, the value of reliability and honesty will be lost. The old idea that the use of advertising space in local papers is merely a method of buying the support of the editor has been proved too utterly false to excuse its lingering longer in any man's mind. There may be a few papers that can be bought in this way, but usually it wins only the contempt of the editor.

Lamp Socket Can Now Replace Antenna and Battery

Bureau of Standards Development Makes Possible the Use of 60-Cycle Supply for Electron-Tube Filament and Plate

RADIO receiving connections have been devised by the Bureau of Standards which dispense with the storage battery normally required for vacuum-tube sets and substitute therefor a plan whereby the filament and plate can be energized from an ordinary 60-cycle lamp socket. This development, which will be discussed at greater length in a later issue of the ELECTRICAL WORLD, places radio-receiving sets in the class of domestic energy-consuming devices that can be served from the lamp socket. Thus the innovation, combined with the carrier-current method of broadcasting and reception already noted in these pages, makes it possible for the public to look to the lamp socket not only for the power to operate the usual electrical household conveniences but for entertainment as well. No antenna or storage battery is required with the set if it be connected to the lamp socket through a small-capacity condenser such as is available on the market at the present time. The set may, however, be used with the ordinary elevated wire antenna, coil antenna or a special form of antenna.

Aside from the fact that the electron-tube filament and plate may be energized from a 60-cycle source, the set is unusual in that it uses a crystal detector and no vacuum-tube detector. The electron tubes are used chiefly as radio and audio amplifiers, but also as a 60-cycle rectifier. A diagram of the outfit, including the means of supplying current to a loud-speaking telephone receiver, is shown here.



THREE RADIO AMPLIFIERS, A CRYSTAL DETECTOR AND TWO AUDIO AMPLIFIERS ARE USED IN THIS RECEIVING OUTFIT, WHICH DISPENSES WITH A STORAGE BATTERY

The Bureau of Standards has the following to say about this new development:

"The storage battery ordinarily required to light the filament of electron tubes is a drawback to the general use of radio sets. The battery must be charged from time to time, it is bulky and heavy, and the acid in it is a source of danger and damage in a household. In this amplifier both the filament storage battery and dry battery used in the plate circuit are replaced by a special transformer and an electron-tube rectifier and accessories, the aggregate bulk and weight of which are less than that of the battery. It uses a small 10-volt dry battery in the plate circuit, which is required to deliver only a very small current and should have a life practically equal to the life of the battery if not used at all; that is, at least several months. In order to reduce the hum of the alternating current, there are more adjustments to make than in the ordinary amplifier supplied for batteries.

"Of the parts in this amplifier which replace the storage battery in the ordinary amplifier, the special transformer is the only one the cost of which would approach the cost of a storage battery. The cost of the transformer would probably be mainly the labor of assembling. A statement was made in an early announcement of this amplifier that the storage battery is the most expensive part of the home-made radio receiving set. This may have been somewhat misleading, as the aggregate cost of the electron tubes and amplifiers which employ several tubes may exceed the cost of the battery. The cost of the battery, however, plus the cost of the usual necessary battery-charging apparatus, generally exceeds any other item even in an elaborate amplifier.

"A few details of the amplifier, which utilizes 60-cycle current supply for both the filament and plate of the electron tube, are as follows: This amplifier has three radio-frequency stages and two audio-frequency stages and uses a crystal detector. The 60-cycle current when used in an ordinary amplifier circuit introduces a strong 60-cycle note in the telephone receivers and makes reception impossible. This has been practically eliminated by the balancing resistances, grid condensers and special grid leaks of comparatively low resistance, by a telephone transformer in the output circuit, and by the use of a crystal detector instead of an electron-tube detector. In the final form of the amplifier there is only a slight residual hum which is not objectionable. The amplification obtained with alternating-current supply was as good as that obtained with the same amplifiers used with direct-current supply. The complete outfit is compact and portable. The amplifier as constructed operated most satisfactorily for wave lengths of 200 m. to 750 m. By using suitable radio-frequency transformers this range can be extended to receive any radio wave."

Secondary Construction of Proved Value

Based on an Extensive Study Made by the Chillicothe (Ohio) Company Prior to Rebuilding Distribution System, Its Excellence Has Been Demonstrated by Experience

By L. C. PETERMAN
Formerly Electrical Engineer Ohio Utilities Company, Columbus

PREPARATORY to rebuilding and modernizing its entire distribution system in 1918, the Chillicothe (Ohio) Electric Railway, Light & Power Company made a thorough study of the available methods of supporting secondary circuits. Since the methods which were adopted have now been in service about four years with entire satisfaction, some of the details may be of interest to other companies.

In selecting the form of support careful consideration was given to the following factors: Initial cost and installation expense, life, appearance, ease and cost of connecting service wires, protection from falling wires and lightning, and amount of stock that would have to be carried. After considerable investigation it was decided that steel brackets with the wires mounted in a vertical plane would be most desirable. However, when it came to the actual work of installing the secondary racks, it was found that the linemen and line foremen were almost totally unfamiliar with such construction and that there were no adequate specifications covering it. The available information was limited largely to the rather meager data in manufacturers' catalogs, and it was found desirable to conduct a few experiments to develop specifications which would eliminate hit-and-miss construction, to standardize on desirable methods and to utilize to the full the desirable features of rack construction. The points which required the most study were (1) dead-ending, (2) turning corners and (3) transformer wiring (on poles), as it was soon found that these operations must be performed in an entirely different manner from that customary when cross-arms are used. Following are the major points of the specications as finally drawn up, with notes giving reasons for the conclusions reached:

Neutral at Top of Rack

All three-wire, single-phase secondary mains should have the (grounded) neutral tied to the top insulator of the rack.—The chief reason for this is to provide protection against falling primary wires as well as bare telephone, telegraph and signal wires of other companies, preventing in the first case the entrance of high voltage on house services and in the latter the grounding or short-circuiting of transformers. This protection is not available when secondaries are supported on cross-arms, but when racks are used it is easy to secure and becomes one of their chief advantages. When running three-wire services the neutral will be carried to the building in the same relative position, and if the house neutral is brought out of the service condulet in the center of the cover, the service gang may find it advantageous to remove the cover and thread the neutral through one of the end holes.

The average lineman will soon develop several methods of preventing crosses and maintaining proper clearance between wires (Fig. 1 A). For two-wire residence services the electrical contractors were instructed to bring the neutral wire through the service condulet and service cut-out box in the same relative position for all jobs, permitting rapid and correct connecting of meter and service drop. With two-wire services placing the neutral on the top insulator of the rack presents exactly the same conditions as when cross-arms are used.

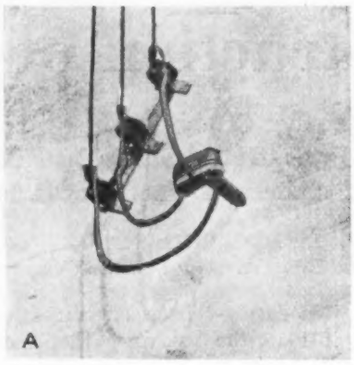
Another reason for tying the neutral to the top spool of the rack is the protection afforded from lightning in the case of extended secondaries in the outlying, sparsely settled districts. In one case, on an unprotected hill where lightning is particularly severe, nearly every electrical storm had been responsible for one or more transformer and meter burn-outs, in spite of a rather high density of arrester installations. In rebuilding, the transformers were removed as far as possible from the brow of the hill and were installed in lower and better protected areas, the secondaries, somewhat longer than usual, being solidly grounded at every second span. The ensuing summer season saw a material improvement in service, and transformer renewals were considerably decreased in number.

Racks on tangent poles should have wires tied on the outside of the insulator spools, i.e., on side away from pole (Fig. 2 upper left center).—If this is not done, a wire riding down off the insulator, as often happens even with cross-arm construction, would ground the secondary on the metal of the rack. If this happens, the displacement of the wire from the proper position would not be over 1½ in. (3.87 cm.), making detection difficult. Further, if the wires are strung inside the rack, on the pole side of the insulator, the wires must be laboriously pulled through each rack or the rack must be completely disassembled, considerable time being consumed in the operation. When the wires are pulled tight, unless extreme care is exercised, the linemen are apt to leave a rack here and there with the tie wires unattached. If the wires are tied on the outside, failure to tie in firmly will cause them to fall entirely away, making preliminary inspection and subsequent "trouble shooting" easy. As racks need not be disassembled, a saving in construction time is also apparent (Fig. 2 left). In turning corners and at angles in the line the position of the wires on the insulators will depend on the direction of the strain (Fig. 2 left center).

Dead-End Long Secondaries at Corners

In turning corners secondaries longer than two spans in either direction should be dead-ended in both directions at the corner (Fig. 3).—This construction is specified to prevent chafing of the insulation and crystallization of the copper as the pole sways slightly in the wind, and to provide construction less susceptible to the communication of physical influences affecting adjacent spans. When dead-ends are made in both direc-

Good and Bad Practices in Secondary-Service Construction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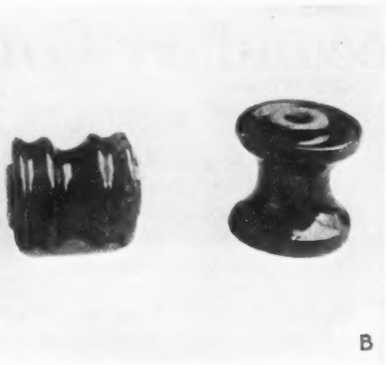
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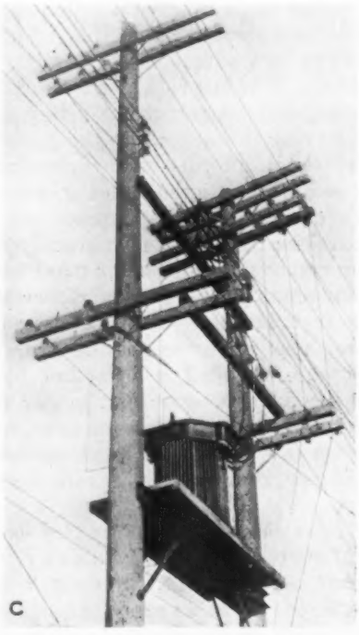
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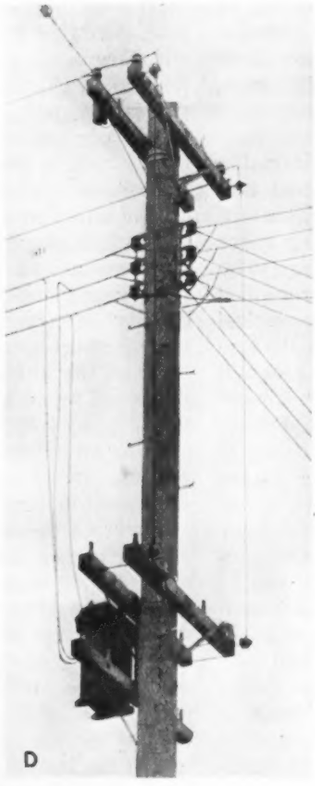
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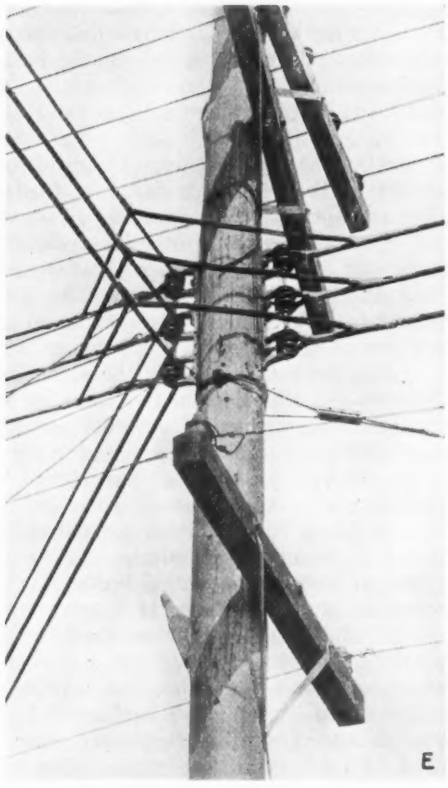
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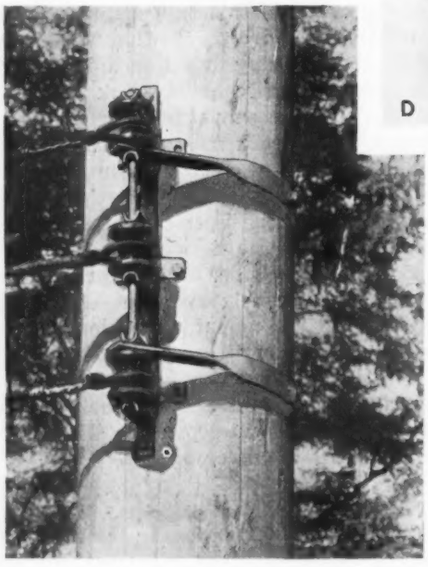

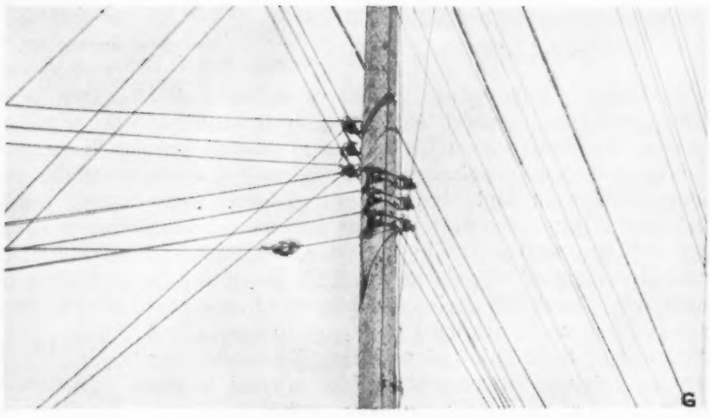
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Fig. 1—A—Placing house-service neutral at top protects against falling primary and signal wires. B—Insulator at right provides ample space for service pull-offs. C and D—Low-hung transformers connected with secondaries at top of pole. E—Heavy secondary construction that affords free climbing space. F—No. 6 wire dead-ended on light rack. G—Faulty construction in which too light rack is used and no climbing space.

tions, subsequent change of position or renewal of rack can be very easily made without cutting the secondary.

Dead-ends should be made on bare copper and soldered (Fig. 3).—When an insulated wire is dead-ended on a single insulator, the free end will start to unwrap and twist back on the span wire as soon as the pulling blocks are eased off, if the tension is appreciable. With cross-arms double-arm construction affords adequate support at dead ends, but in vertical construction dead-ends are of necessity made on a single insulator. Since rather small sags are employed with a considerable stress on dead-end supports, some method must be employed to maintain the sag selected. If the insulation is removed, a rigid twist made on bare wire and solder then applied, more than twice the pull can be exerted before the end will start to unwrap. It should not be understood that any dependence is placed on the solder for mechanical strength. The main support of the span wire depends on the twist given to the free end at the insulator. Solder is used only to insure greater adhesion of the bared copper and to improve the rigidity of construction.

Dead-ends should be supported on racks only, not on strain insulators.—Since racks with adequate strength for any purpose can be obtained, it was decided that there was no reason for dead-ending on strain insulators, where the eye-bolts, thimbles, guy-wire, etc., required would make none too neat a job and cost considerably more to install. At any rate, a rack would be required for service pull-offs, and by using wet-process insulators, which are specified by this company for all heavy racks, one rack would provide for both the heaviest secondary dead-ends and any service pull-offs required. Where wires heavier than No. 2 are used three through-bolts are installed at dead-ends (Fig. 2 top center).

USE RACKS OF PROPER STRENGTH

Racks having adequate strength for the purpose intended should be used.—Specifically, the light rack shown in Fig. 2 (right) is used only for No. 6 secondaries. It is felt to be a decided mistake to use this rack for heavier wires. All sizes over No. 6 are installed on the heavy rack shown in the same figure. For No. 6 dead-ends the rack is installed on the side of the pole, to facilitate extensions and to remove the direct strain from the lag screws (Fig. 1 F). For larger secondaries the heavy rack is placed on the face of the pole, to prevent twisting or splitting of the pole and to develop its full strength and the full strength of the supporting bolts (Fig. 1 E). If an extension be later required, the rack is moved to side of pole as shown in Fig. 2 (bottom), the alternative method not being permitted because unworkmanlike and objectionable in appearance.

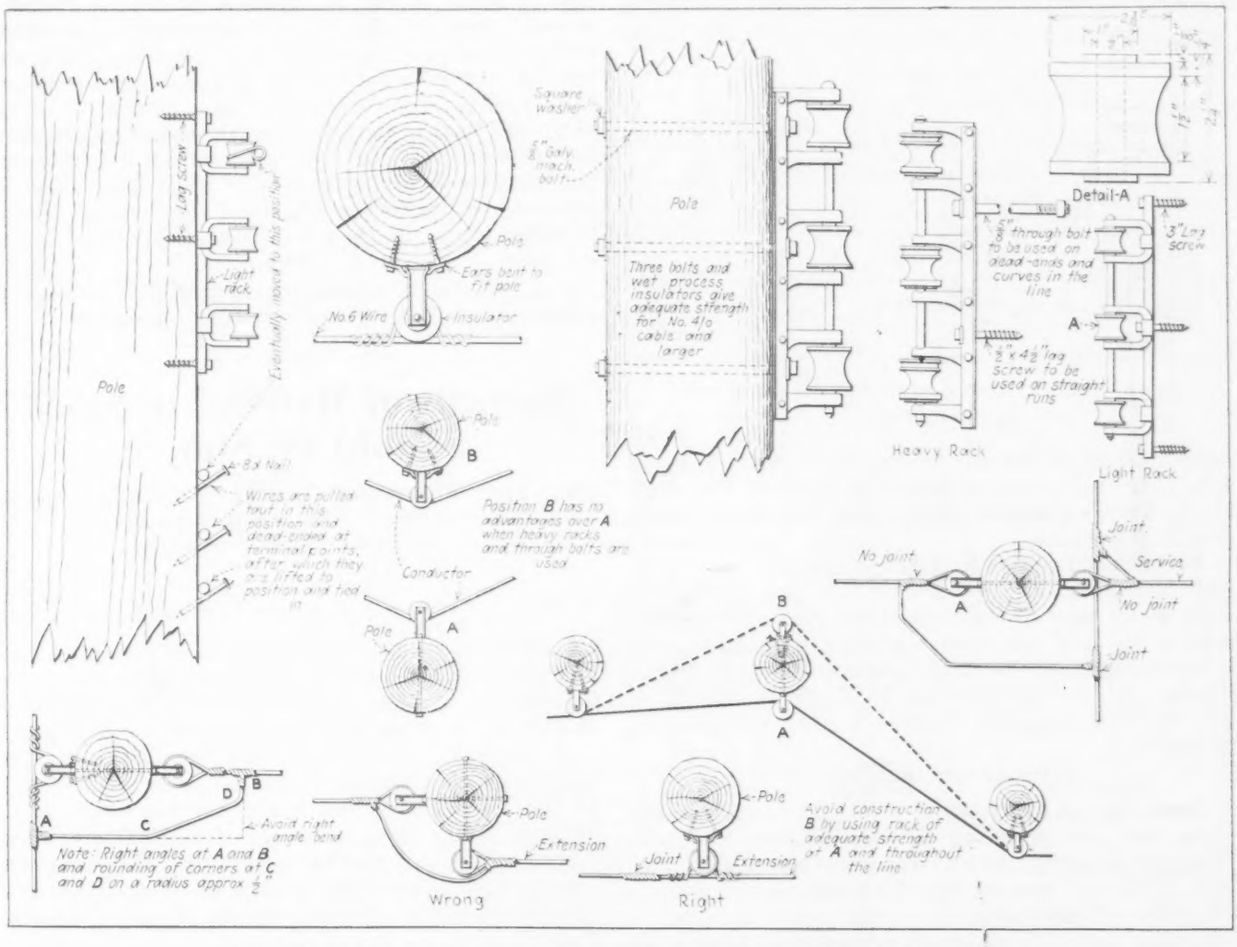

Square washer
5/8" Galv. mach. bolt
Pole
Lag screw
Light rack
Eventually moved to this position
Ears bent to fit pole
No.6 Wire
Insulator
Three bolts and wet process insulators give adequate stfength for No. 4/0 cable and larger
Detail-A
5/8" through bolt to be used on dead-ends and curves in the line
3" Lag screw
5/8" x 4½" lag screw to be used on straight runs
Heavy Rack
Light Rack
8d Nail
Wires are pulled taut in this position and dead-ended at terminal points, after which they are lifted to position and tied in
Position B has no advantages over A when heavy racks and through bolts are used
Conductor
No joint
Joint
Service
Avoid right angle bend
Note: Right angles at A and B and rounding of corners at C and D on a radius approx ½"
Extension
Wrong
Right
Avoid construction B by using rack of adequate strength at A and throughout the line

FIG. 2—SOME FORMS OF CONSTRUCTION WHICH WERE FOUND PREFERABLE TO OTHERS

Racks should be installed with lag screws and bolts, no nails or screws to be permitted.—Bolts and lag screws are used, as shown in Fig. 2 right, to develop the full strength of the rack.

Racks and brackets should be confined to the particular use for which they are specified.—Fig. 2 right shows pole rack and brackets, while the bracket shown in Fig. 1 A is intended exclusively for supporting service

wires at the building. The latter are not permitted on poles on account of considerations of strength. For house use, however, the "loop-through" construction is advantageous, and it is economical in first cost. Therefore, for the sake of uniformity, the light pole brackets are under no circumstances used for house brackets. Promiscuous interchanging of the functions of the various brackets is not permitted.

Only one set of secondaries should be strung on racks on a given pole.—If two secondaries (*e.g.*, a single-phase and a polyphase power secondary) are required, they may be advantageously placed on cross-arms. Two racks mounted one above the other take up considerable space on the average pole, while if they are mounted on

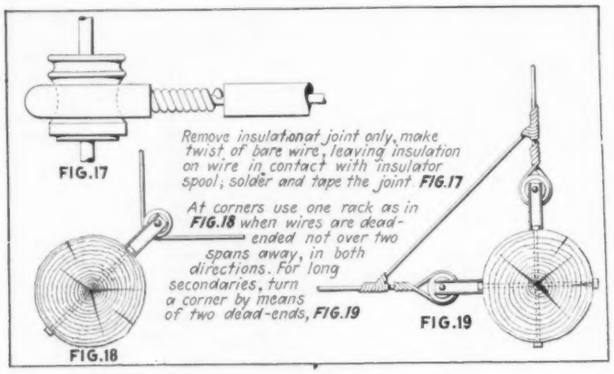


FIG.17
Remove insulation at joint only, make twist of bare wire, leaving insulation on wire in contact with insulator spool; solder and tape the joint. FIG.17
At corners use one rack as in FIG.18 when wires are dead-ended not over two spans away, in both directions. For long secondaries, turn a corner by means of two dead-ends, FIG.19
FIG.19
FIG.18

FIG. 3—FORM IN WHICH INSTRUCTIONS ARE ISSUED TO LINEMEN

opposite sides of the pole inadequate climbing space is left (Fig. 1 G) unless extension brackets are used, strength and rigidity of construction being usually sacrificed in the process.

Racks should always be placed on the same side of the pole throughout the run and on that side of the pole from which most of the services are run.—This is done even if the pole line offsets or changes direction, with wires falling into the strain position shown in Fig. 2 (lower right). Maneuvering to obtain position B is not justified if proper racks are used and properly attached.

WIDER-SPACED RACKS BEST

Racks having a spacing of 8 in. (20.3 cm.) between wires are used exclusively by the Chillicothe company. The only advantage discovered for the occasionally used 4-in. (10.2-cm.) spacing was the lower reactive drop in the wire. Computation on several typical secondaries showed a negligible saving in voltage loss of the order of 0.01 volt to 0.03 volt. On the other hand, the wider spacing is of advantage in maintaining proper clearance between conductors under unfavorable weather conditions, and it is of great advantage when running services and in soldering connections, where a slip of the hand may bring a lineman's pliers or solder ladle across the bared wires, an interruption to service as well as injury to the workman resulting. This is particularly true where the wires are large and the transformer is fused heavily.

Wiring of transformers on poles is still a subject of study by the company, particularly where it is desired to mount heavy transformers at say 15 ft. (4.5 m.) from the ground, while the secondary must of necessity be mounted at the third or fourth gain of a 45-ft. (13.7-m.) or 50-ft. (15.2-m.) pole. If the vertical buses are left unsupported, even solid wire will not make a sightly job, while the use of cross-arms is unsightly and expensive. Transformer installations where this difficulty was encountered are shown in Fig. 1 C and D. The company would appreciate any suggestions on how to obviate the trouble.

The specifications mentioned were prepared in the form of small blueprints measuring 4 in. x 7 in. (10 cm. x 17.5 cm.), the same size as the meter and service specifications of the company, described in the ELECTRICAL WORLD for Feb. 28, 1921, page 359. They were supplied to the line foreman and other employees concerned, and in a few cases both sets of specifications were bound together for the use of inspectors, draftsmen and others. An example of the form of specifications is shown in Fig. 3. These specifications are presented largely in the hope of inspiring constructive criticism and to call attention to the fact that the problems of rack construction are real and require study. Inspection of rack construction in a number of cities and towns leads to the belief that the operating company has permitted racks to be installed without the engineering department having previously given any study or attention to the matter, the usual result being failure to utilize to the full the advantages of this type of construction.

J. C. Martin is general manager of the Chillicothe company and F. K. Sexauer resident manager.

Records of Material in Stock Should Be Simple

Only Four Forms and Two Book Records Used in Accounting for Storeroom Stock of the Nebraska Power Company

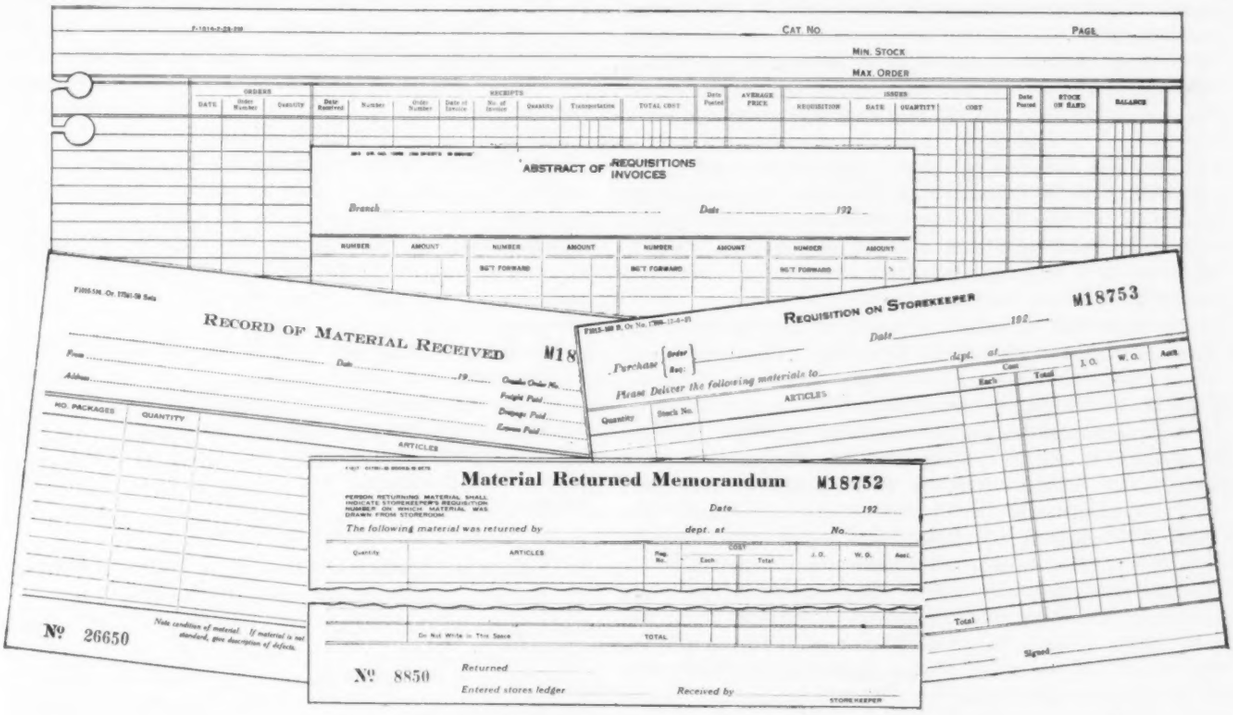
BY ROY PAGE
General Superintendent Nebraska Power Company, Omaha, Neb.

A SIMPLE and yet comprehensive system of accounts is necessary to maintain an accurate record of material and supplies. Without such a record a considerable expense may be incurred in the course of a year, through loss, theft, breakage and the like. The three principal elements of such a system are the stock on the shelves, the stock ledger and the stock-control account. These three items should be kept in continuous balance, and it was for the purpose of maintaining such a balance that the system to be described was put into operation at the Nebraska Power Company's store.

Four forms are used in handling receipts and issues of material—the receiving, requisition, return and invoice abstract forms. The receiving form is made in triplicate (6 in. x 9 in.) by the storekeeper, a separate slip being made to cover each shipment of material received, regardless of whether such shipment comes from a manufacturer or is returned to the storeroom by some department. The original is sent to the purchasing agent, the duplicate to the stock-ledger clerk and the triplicate retained by the storekeeper. The requisition form is made in triplicate (6 in. x 9 in.) by any one desiring to withdraw material from the storeroom, and no material may be withdrawn except by such a requisition. The original is presented at the storeroom when the goods are withdrawn, the duplicate sent to the stock-ledger clerk and the triplicate retained in the maker's file. The return form is also made in

duplicate (6 in. x 9 in.) and is in the nature of a journal entry, charging stores and crediting an operating or construction account. The original is sent to the stock-ledger clerk and the duplicate retained in the maker's file. An invoice abstract form is used to abstract totals of invoices or requisitions posted in the stock ledgers for the purpose of making entries in the control account. It is made in duplicate (8 in. x 11 in.). The original accompanies the invoices or requisitions and the duplicate is retained by the stock-ledger clerk.

Only two book records are used in covering stores transactions—first, the control ledger, which deals in totals only and is debited from the abstracts of invoices and credited from the abstracts of requisitions; second, a combination detail stock ledger and stock record. No record of stock is kept at the storeroom; in fact, no



FIVE FORMS FOUND HELPFUL IN KEEPING STORES RECORDS

records are kept by the storekeeper other than a file of purchase orders and the receiving-slip duplicates. On his copy of the purchase orders he keeps a record of shipments received, filing the order away as "filled" when all shipments covered by it are complete.

The detail stock ledger and stock record is the full and complete record of orders, shipments received, invoices, prices, issues and stock on hand. The stock-ledger sheet is divided into three main heads—orders, receipts and issues. The stock-ledger clerk receives copies of all purchase orders covering material which will be charged to "stores" (those covering material which will be charged to an operating or construction account direct being omitted) and enters such orders in the columns provided. When material has been received in the storeroom, he enters from the "receiving slip" the date and quantity received, in the proper columns. Invoices received later to cover these shipments are posted in the columns provided. Requisitions which have been filled by the storekeeper are sent to the stock-ledger clerk daily and are posted under "issues." In a column headed "stock on hand" is carried forward a continuous record of the quantities of material still in stores (*i.e.*, quantities on hand plus receipts minus issues), and monthly or at other necessary intervals the quantity and money balance is extended to a "balance" column.

The basis upon which this system is founded is that a "store number" shall be given to each successive stores transaction, whether receipt or issue, by the storekeeper. These numbers are consecutive and are applied to both "receiving slips" and "requisitions" with a numbering stamp. From that time on, all documents relating to that particular transaction are marked with this "store number," and this number is used for posting, reference and all other records. For example, a purchase order is placed for a hundred machine bolts. The first shipment received on this order is fifty bolts. A "receiving slip" is made for the fifty bolts and is stamped "Store No. 451." This number appears on the original sent to the purchasing agent and on the duplicate sent to the stock-ledger clerk. The latter, upon receipt of his copy, posts in the proper columns under "receipts" the "Store No. 451," date, order number, and quantity received. Later, when the invoice is received by the purchasing agent to cover the shipment, the same "Store No. 451" is transferred to the invoice and the invoice sent to the stock-ledger clerk. The latter again uses this number (451) in posting and listing the invoice on his "abstract of invoices."

The advantages of this "store number" system are three: First, it insures that every transaction taking place in the storeroom must eventually be entered on the books; second, it insures that every transaction entered on the stores ledger shall be entered on the control account; third, it fixes the date of each stores transaction regardless of when requisition or other papers were dated, which is very helpful during inventory or when balancing detail against control accounts. It is only necessary to know the first and

last number posted and that the same "store numbers" have been posted to both detail and control accounts to know whether or not a clerical error has been made.

Instead of the usual annual inventory, with the attending extra labor of counting, pricing and extension, a perpetual inventory is kept in operation by the following means: Whenever material is received a count is made by the storekeeper and entered on the "receiving slip" covering such material. This count, when received by the stock-ledger clerk, is checked against the stock on hand as shown by the ledger, and errors are run down and corrections made when necessary. The "store number" on the "receiving slip" will provide a means of knowing that all transactions to date have been posted. This arrangement reduces the work of inventory and in addition keeps the ledger in much closer agreement with the stock on the shelves.

Corrections are made much more often on rapidly moving stock than is possible with any other system. Shortages will be discovered in time to investigate before they become "stale," and rapidly moving stock is inventoried frequently while slower-moving stock is counted less frequently, which is desirable. An annual inventory, while interesting, is seldom of great value owing to the fact that before such an inventory can be priced and extended and entered on the books errors have already been taking place which tend to throw the ledgers and stock out of balance.

On each ledger sheet a space is provided for the "minimum allowable stock" and the "maximum allowable order." These quantities are fixed by some one familiar with the requirements of the system and are based on the quantities used per unit of time, the time necessary to obtain shipments, standard-package discounts and such other items as may enter. Items for which a "minimum stock" and "maximum order" have been fixed are ordered through the purchasing agent by the stock-ledger clerk, who places an order for the "maximum" when his books show that his stock has fallen to the specified "minimum." Material not regularly used is usually marked with a "minimum," and the name of the head of the department which uses such material is inserted under "maximum order." When such stock reaches the specified minimum, the department head is notified, and he may instruct that additional material be ordered or that such material shall no longer be used.

Labor Used in Building Power Plant Is 10.62 Man-Days per Kilowatt

ON THE Kerckhoff and Kern Canyon projects, the two hydro-electric developments most recently completed by the San Joaquin Light & Power Corporation of Fresno, Cal., the total labor charges on the jobs were divided by the average wage, and this figure in turn was divided by the number of kilowatts of installed capacity to determine the number of man-days used in installing one kilowatt. On the Kerckhoff job the figure of 9.55 man-days was obtained on an installation of 42,600 kw., while on the Kern Canyon job, which was the enlarging of an old project and presented more difficulties, the figure of 14.90 man-days per kilowatt was obtained on an installation of 10,600 kw. Adding the total man-days on these two jobs and dividing by the total kilowatts of the two installations gives an average of 10.623 man-days per kilowatt.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Hawthorne as an Electrical Prophet

To the Editors of the ELECTRICAL WORLD:

One of my hobbies is the collecting of books of quotations, and from these books I have been for some time selecting passages that interest me particularly. In one of my collections I have come across the following:

"Is it a fact—or have I dreamt it?—that by means of electricity the world of matter has become a great nerve, vibrating thousands of miles in a breathless point of time? Rather, the round globe is a vast head, a brain, instinct with intelligence; or shall we say it is itself a thought, nothing but thought, and no longer the substance which we dreamed it?"—*Nathaniel Hawthorne.*

When one remembers that Hawthorne's day was that of Emerson and Thoreau, long before the marvelous electrical development of the last thirty years, one marvels at the far reach of his imagination. You can almost see the prophecy of the radio telephone in his vision of the future. J. ROBERT CROUSE.

Cleveland, Ohio.

Yellow or Amber Glasses Best When Welding

To the Editors of the ELECTRICAL WORLD:

On page 485 of the March 11 issue of the ELECTRICAL WORLD appear a number of safety rules for arc welders adopted by a Pacific Coast industrial concern. A formal set of rules such as this is very valuable, in that the instructions to the operator are put in brief form, are concise and make it easy to call the operator's attention to points that should be absorbed. They also serve as a constant reminder and tend to prevent the operator becoming careless.

The subjects are very well selected, but the first two are, I believe, based on false premises. It has long been known that blue glasses reduce the glare of ordinary light to a very great extent. For this reason a welder feels that they will do the same with the light from the arc. This is not the case, however. In the December, 1918, issue of the *General Electric Review* W. S. Andrews discusses this question, illustrating his article by numerous spectra. One illustration, showing the spectrum of the "Mazda" lamp compared with that of an iron arc, proves that the "Mazda" lamp has more of the red radiation and not so much of the ultra-violet as the iron arc. This is logical from the fact that the iron arc is at a much higher temperature than the filament of the "Mazda" lamp. The spectrum, comparing various glass screens, is based on the use of the "Mazda" lamp, and in comparing these glasses for welding service it should be borne in mind that the range of light will extend further into the ultra-violet

than is shown by the illustrations. Another illustration (spectrum C) shows the light from a "Mazda" lamp as viewed through a sheet of clear colorless glass. This shows very little absorption, the range being practically the same as without the glass. There is comparatively small absorption of the ultra-violet. In the same illustration (spectrum G) is shown the result of using a cobalt-blue glass. This glass absorbs considerable of the radiation in the red and yellow, but transmits practically all the radiation in the ultra-violet.

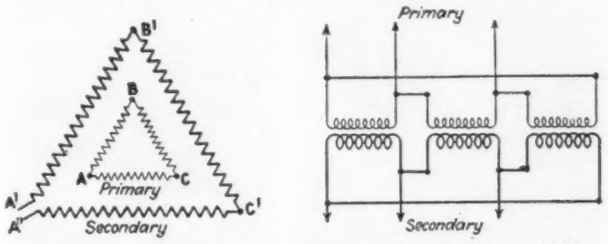
The false feeling of security engendered by using blue glass for welding has caused more than one pair of sore eyes. A much better practice is to use yellow or amber-colored glasses in goggles. This glass cuts off the ultra-violet, as shown in spectrum E of this same illustration. At the same time it permits greater visibility of the objects about the room, a very desirable quality since the operator wears these glasses at all times.

H. L. UNLAND,
Power & Mining Engineering Department.
General Electric Company,
Schenectady, N. Y.

Checking Transformer Connections

To the Editors of the ELECTRICAL WORLD:

Referring to the article on "Two Methods of Checking Transformer-Bank Connections," by Eustace C. Soares, in the ELECTRICAL WORLD of Feb. 18, the voltage measured across *A'A"* in the delta connection is not always as he states, namely, either zero or twice normal secondary-phase voltage. The voltage at these points before closing the delta may be 20 or 30 per cent of phase voltage due to harmonics, and yet the connection would be correct. If a slight load is applied, however, to these two points with the voltmeter still attached, the voltage will collapse and on closing the delta would be apparent only in a very small negligible circulating current. If there is no possibility of a small section



LEFT, SECONDARY LEFT OPEN FOR CHECKING VOLTAGE *A'A"*. RIGHT, STANDARD DELTA-DELTA CONNECTIONS

of the winding being reversed, as might be the case when such sections are installed for slight increases in line voltages to overcome line drops, then it would be considered safe to connect the points *A'A"* if a voltage less than half normal secondary-phase voltage existed across the two points previous to connecting them together.

The incorrect connection—one or two phases reversed—would be more readily noticed because of the much higher voltage present in that case. This peculiarity, due to harmonics and occasionally to slight variations in coil windings, is not so noticeable when phasing out for series or parallel connections so the voltmeter method can then be depended upon absolutely.

A lamp bank is generally more preferable for phasing out low-voltage transformers than Mr. Soares' second method of blowing a fuse. If the lamps light when connected to points *A'A"* instead of the fuse, it would, of course, indicate that there is a current flowing which would be due to unequal voltages caused by incorrect phase connections. This method, however, must be applied with intelligence and lamps must be used in series to correspond to voltage of the transformer.

Franklin Union, Boston, Mass. EDWARD A. GIBBS.

Destruction of Wooden Poles by Insects

To the Editors of the ELECTRICAL WORLD:

R. E. Cunningham, superintendent of distribution for the Southern California Edison Company, Los Angeles, called attention to the destruction of wooden poles, cross-arms and pins in a letter published in your columns on April 8. Mr. Cunningham refers to the ravages by termites, sometimes called "white ants."

Different species of termites have been found in latitudes as far north as Massachusetts and New Hampshire, and very serious destruction has been wrought by them. However, destruction of wooden poles is by no means limited to the work of these insects. We have recently examined a large number of telephone poles which have been almost totally destroyed by the work of another insect, popularly called the black ant or carpenter ant, *camponotus herculaneus pennsylvanicus*, indigenous to the eastern section of the United States.

This ant appears to be one of the most destructive and most cunning in its habits. A series of telephone poles on one street alone were attacked in a manner very similar to that shown in the picture by Mr. Cunningham. The ants hollow out entire trees, cherry, chestnut and even hard maple. They usually nest in these trees and from these nests send out foraging parties, which finally establish themselves in other habitations. They live partially on the wood but dig out the wood with their powerful mandibles and build for themselves most elaborate tiers and tenements.

On first noticing this destruction, which had extended also through the main supports of several wooden houses, Dr. L. O. Howard, in charge of the Department of Entomology of the Department of Agriculture in Washington, was consulted. The advice rendered by Dr. Howard indicated a most effective method of dealing with these insects. They appear to be almost indifferent to the harshest poisons known to man, but it has been found possible to asphyxiate them by means of the vapor of carbon disulphide, CS_2. Impregnation of wood by means of creosote and other coal-tar preparations does not appear to be of much value, though it appears to spoil the taste of the wood for the insects for some time.

There is no doubt in the writer's mind that the menace from these insects is incalculable and that we are only beginning to enter into a period where the destructiveness of the ants will be carefully observed and their work traced to the source. It is a fair prediction that in the future man will have to contest with the ant for the possession of structures which contain wood, and, in fact, it would appear unwise to utilize wood where it is exposed to insects' attacks.

The wholesale destruction of telephone and telegraph poles which occurred in New England during the severe sleet storm in the early part of last winter indicated very clearly the deterioration of the timber wrought by both the white ants and the black ants.

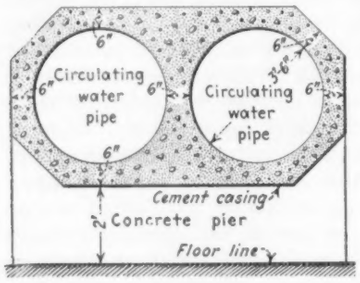
B. A. BEHREND,
Boston, Mass. Consulting Engineer.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Econor. ical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Repair Condenser Circulating-Water Pipe with Concrete

TO SAVE the cost of a shut-down of a 12,000-kw. steam turbine at the Redondo station of the Southern California Edison Company while the circulating water pipes were being repaired, the expedient of incasing the entire pipe in concrete was used. Serious leaks had developed from inside corrosion caused by the circulating sea water, but the turbine could not be spared from service for the month that would have been required to replace the old steel pipe with a new one. The pipe was, however, too badly corroded to permit of successful patching. After investigating various methods of making repairs, it was found that it could be incased in concrete for about one-half the cost of renewal.



INCASING LEAKING CIRCULATING-WATER PIPE IN CONCRETE CUTS COST OF REPAIRS IN HALF

A form was built around the pipe, the pipe itself being used as the inside form, and the concrete was poured to the shape shown in the accompanying cut. Throughout the work the turbine was in operation. One hundred and seventy-five feet of piping was repaired by this method, and this pipe has been in successful operation for a number of years without any leaks having developed.

J. W. ANDREE,
Engineer Operating Department.
Southern California Edison Company,
Los Angeles, Cal.

Park Cable Laid Across Marshland in Shallow Trench at Low Cost

PARK cables of unusually great length and high voltage have recently been installed between Flushing and Forest Hills, Long Island, covering a distance of about 2½ miles between ends of existing conduit systems. Two similar cables are laid in a trench 12 in. wide and 18 in. deep. They serve as parts of tie lines between the Flushing and Jamaica substations of the New York & Queens Electric Light & Power Company.

Three-conductor, 15,000-volt cables are used in the above installation. The conductors are sector-shaped, and the insulation is impregnated paper protected against moisture by a lead sheath. The armoring consists of two galvanized-steel tapes with a layer of asphalted jute over and under the armor. The cable is, in fact, an ordinary paper-insulated, lead-covered cable such as is installed in underground conduits, with the addition of steel-tape armor to protect it against mechanical injury after it has been laid in the trench.

The reasons for laying the cables in a trench rather than constructing either an aërial or a conduit line in this particular case are:

1. The cables are entirely within the limits of the city of New York and the municipal authorities will not permit aërial construction for such high voltages. Underground construction is therefore imperative.

2. The route which the cables traverse is practically open country, the lowlands being marshes and the higher ground farmland. The marshland is being gradually filled in and is, moreover, intersected by numerous small creeks and the following conditions render conduit construction undesirable:

(a) The difficulty and expense of constructing conduit in marshland.

(b) The creeks which have to be crossed call for armored cable of some kind, and park cable is entirely adequate for these. It is an easy matter to dig a trench at low tide to the edge of the water and lay the cable through it without splices. If conduit construction with plain lead-covered cable had been employed, it would have been necessary to splice the sections of armored cable at these crossings.

THIS TRENCH METHOD OF LAYING CABLE SAVED THE EXPENSE OF CONSTRUCTING CONDUIT

Left—Cable unwound from reel on truck and laid in trench by six men. At the same time one man straightens out bends while another brakes the reel as the cable is unwound. Right—In crossing a creek the trench was dug to water level at low tide and the cable laid across.

(c) Although the route of the cables is along highways or streets, some of them have not yet been cut

through. This, together with the fact that all of this territory is still in an undeveloped condition, makes it at present impracticable to determine the ultimate levels of either proposed or existing streets.

(d) If later on it becomes necessary to take up the park cable when this section is more fully developed, the armor may be stripped off, leaving an ordinary lead-covered cable which can be installed in conduit. It is, however, expected that there will always be considerable use for park cable in this territory.

When paralleling a highway the trench has to be dug along one side as shown in the illustration. At several points, however, it has been possible to reduce distances materially by leaving the main highway and cutting across swamps and farms. In such cases proposed streets are always followed, although they may not be cut through for many years to come.

Considerable ingenuity had to be exercised to get the large electric trucks carrying heavy reels of cable across the soft ground. It was frequently necessary to construct temporary roadways of planks, and where swamps were crossed the cable had to be pulled by means of a winch on the truck with the aid of tackle attached to convenient trees, etc. The picture on the left shows how the cable is unwound from the reel on which it is shipped and laid in the trench. Although the cable is heavy, six men can lay it in the trench with little difficulty. When conditions are favorable, as along improved highways, where the electric truck can be operated without difficulty, six 500-ft. reels of cable can be laid in a day.

Up to the present time the use of this type of cable has been almost exclusively confined to ornamental street and parkway lighting, but there are a great many other services in which it may be employed to good advantage. It may reasonably be expected that the use of park cable will be greatly extended in the near future, not only in the entirely new fields produced by the inevitable abolition of the isolated plant and the increased utilization of central-station power, but also in those fields where it is now used to a limited extent. The fact that one of the largest and most highly developed power companies has seen fit to resort to the use of park cable on a large scale is a fact of much significance.

F. A. WESTBROOK,
Field Engineer.

Habirshaw Electric Cable Co.,
New York.

Standards for Testing Welds

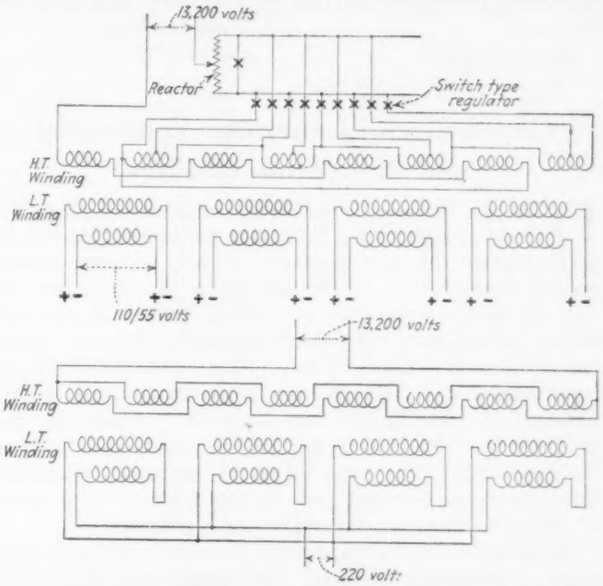
STANDARDIZATION of the procedure in making a test of any kind is obviously necessary before results obtained by different observers can be compared. This is particularly true of welds because of the non-homogeneity of the welded specimens and the irregular section of the added metal. Because of these two factors and differences in details of test procedure widely divergent results and comparisons are frequently made. Consequently the usefulness of much of the research work recorded is restricted, and in many cases the statements are actually misleading.

To correct this condition a committee of the American Welding Society has drawn up specifications for standard tests of welds, comprising shop standards, commercial standards and research standards. These specifications are available in bulletin form and may be obtained from the society.

New York. FIELD EDITOR ELECTRICAL WORLD.

Special Transformers Reconnected with Increased Capacity

THERE are many transformers in plants about the country which were built specially for particular duties during the war and are now set aside and looked upon as obsolete. If these were carefully examined, many could be salvaged at little expense by reconnection and rearrangement of their coils so as to be of service for some other duty for years. A change of this kind was made successfully by an electric furnace company



FURNACE TRANSFORMERS SALVAGED FOR INDUSTRIAL MOTOR LOAD BY RECONNECTION

which had on hand some special transformers bought for supplying furnaces. Not only were they saved, but also by reconnection the capacity of each was doubled.

These were single-phase, 600-kva. transformers of the regulating type, 13,200 volts primary and 55/110 volt secondary. The range from 55 volts to 110 volts on the secondary was accomplished by a regulator which selected tap after tap on the primary winding and thus regulated the secondary voltage by means of cutting in or out certain sections of the high-tension winding. These transformers were designed and built expressly for the one duty and were not considered available for any other service. After the war three of these transformers were placed out of service. When business conditions changed the plant commenced to require considerable more power to operate its small industrial motors. At first glance it did not seem possible that the furnace transformers could be adapted to this service on account of the poor efficiency they offered at any reasonable load and voltage connection. However, upon more complete investigation it was found that they could be reconnected to supply the load efficiently.

In this investigation it was found that the primary and secondary windings each consisted of eight coils. In operating in conjunction with furnaces, to secure 110 volts on the secondary only four coils on the primary were used. The steps down to 55 volts were made by cutting in series across the 13,200-volt supply the other coils by means of a switch-type regulator. These connections are shown at the top of the accompanying illustration. The secondary coils were all con-

nected in parallel for supplying the furnaces. The four regulating coils of the primary were of the same capacity as the main coils, so by simply cutting out the regulating device and connecting these coils in series, paralleling them with the main coils as shown in the lower part of the illustration, the capacity of the transformer was increased from 600 kva. to 1,200 kva. as the capacity of the primary was now doubled and the secondary coils before the change were capable of carrying the full load of 600 kva. at 55 volts. The connection shown at the bottom of the illustration is for 220 volts. By other combinations 110 volts or 440 volts may be obtained.

ALFRED L. WILLIAMS,
Niagara Falls. Consulting Engineer.

Closed-Circuit Generator Ventilation and Prevention of Fires

DURING the past year there have been completed three installations in which generator cooling is accomplished by the passage of air through water sprays in a closed circuit, according to the report of the electrical apparatus committee presented at the recent convention of the National Electric Light Association at Atlantic City. These installations have been designed to obtain cleaner windings, decreased liability of internal fire and lessened combustion, and in one case the conserving of the heat losses from the generator. The experiences of one company along this line were brought out in the discussion, a part of which is given in the following paragraphs.

Nicholas Stahl, Narragansett Electric Lighting Company, Providence, related his experience with the closed-circuit system of ventilation for generators, in which the cooling water is used for boiler feed. He pointed out that when the power factor of the generator is low and the heat losses consequently high it is usually necessary to recirculate the cooling water, because more is required for ventilating purposes than for boiler feed. When a unit is started up after cooling down considerably, the cooling water is not started for several minutes in order to avoid condensation of moisture on the windings. Such successful results have been obtained that this system will be installed on later units.

Results of tests using carbon-dioxide to extinguish generator fires were also discussed by Mr. Stahl. In the installation referred to carbon-dioxide is stored in the tanks under 200 lb. pressure and is released into the closed-circuit ventilating air passages in case of fire. Two thousand cubic feet of carbon-dioxide is admitted into the ventilating space, which has a volume of 33,000 cu.ft. In tests recently made the percentage of carbon-dioxide at the end of one minute was 35 and at the end of thirty minutes was 0.6. The question is whether the concentration is great enough and of long enough duration to stifle combustion. Theoretically 10 per cent of carbon-dioxide should not support combustion. This condition is maintained for ten minutes in the installation referred to. Further knowledge on the subject is necessary.

A. E. Bettis, Kansas City Power & Light Company, cited experience with two generator fires, one of which caused sufficient current unbalance to cause the generator to be disconnected by differential relay protection before serious damage occurred. In the other case the generator was shut down before a short circuit occurred, although the insulation was badly disintegrated and the copper crystallized by overheating of a loose connection.

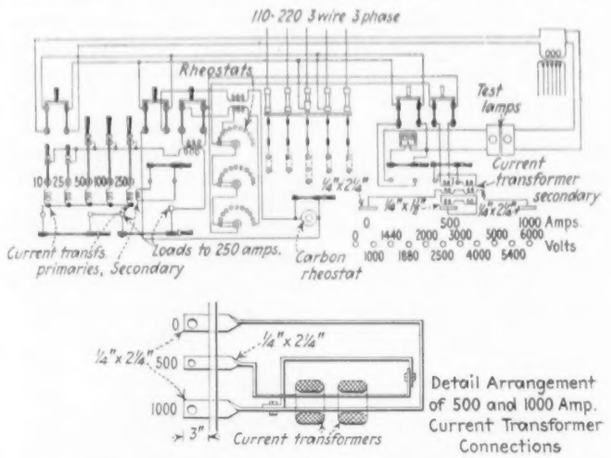
Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Compact Test Board Makes Tests Easy and Economical

A COMPACT test board requiring not more than 2 kw. for operating and suitable for making tests with alternating current up to 1,000 amp. and 6,000 volts is being used by a number of Pacific Coast central station companies for testing relays, switches, ammeters, current and potential transformers, coils and the like.

Five small transformers for obtaining and metering the current and a high-voltage transformer for insulation and ratio tests are the only special apparatus used. A small carbon rheostat is used to vary the current from 1 amp. to 1,000 amp. and a single 5-amp. ammeter for accurately reading the current.

The high-voltage transformer has taps to conform to standard tests for 220, 440 and 2,200-volt apparatus. Taps are also brought out for standard ratios up to sixty to one for potential transformer ratio tests, etc. A fixed resistor is connected in series with the low-voltage winding, which reduces the line voltage from 110 to 100 and serves to limit the current flow when the high-voltage terminals are short-circuited. A lamp connected to the terminals of the resistor is lighted to full candlepower when the insulation of the apparatus under test fails. The control switch for this transformer, which is placed on the opposite end of the

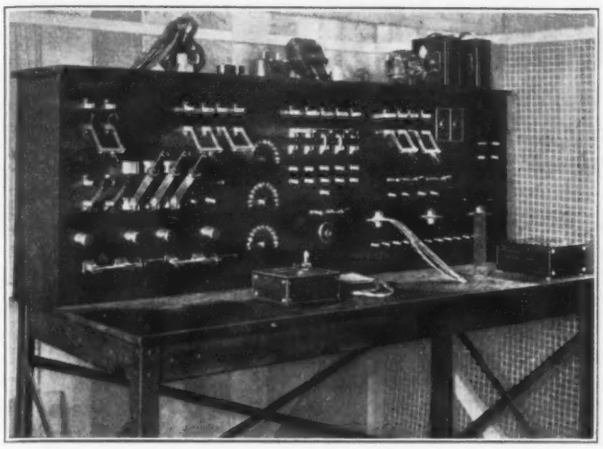


A WIDE RANGE OF TESTS MAY BE MADE BY COMBINATION OF THESE INSTRUMENTS

board from the transformer terminals, thus eliminating danger of shock to the operator, opens automatically when pressure on the handle is released. The diagram of connections for the instrument and test transformers is shown in Fig. 1.

The board also has a testing circuit to indicate grounds, open coils, etc. A small lamp in series with this circuit is lighted when the circuit under test is complete. For very high resistances a sensitive bell is used which rings through as much as 30,000 ohms. The five-pole switch in the center of the board connects a five-wire, 110-220-volt, three-phase, three-wire circuit to binding posts below. This circuit is convenient for testing voltmeters, small motors and electromagnets.

The frame of the testing panel is of steel and the



A SUBSTANTIAL TEST BOARD OF GREAT USEFULNESS

back and top are of asbestos ebony wood, making a safe, fireproof and substantial piece of apparatus, as shown in Fig. 2. The panel height is 5 ft. 5 in. and the length 6 ft. The cost, including all the apparatus and two instruments, did not exceed $750.

Brown & Pengilly, Los Angeles, Cal.

J. G. MOOJEN, Electrical Engineer.

Common Metals and Acids Cause Little Injury to Storage Batteries

THE extent of the injury due to the presence of various impurities in the electrolyte of a storage cell was recently studied by Helen C. Gillette, according to a paper presented before a meeting of the American Electrochemical Society at Baltimore. The results of these tests indicate that, contrary to the general belief, most of the common metals and acids may be present in appreciable quantities without causing serious injury to the cell.

The characteristics of storage-battery performance which might be adversely affected may be classified under four headings: (1) The ampere-hour capacity or output of the battery on discharge; (2) the voltage characteristics on charge and discharge; (3) the rate of self-discharge of the charged battery upon standing, and (4) the life of the active material, which is conditioned mainly by the rate of mechanical disintegration in successive cycles.

The effect of the impurities on the output and voltage characteristics was much less than anticipated. In the case of the output the tests showed that the discharge capacity was unaffected except in three cases, namely, silver, manganese and platinum. In each of these cases a marked decrease of capacity was noted. When potassium permanganate was added to correspond to 0.025 and 0.05 per cent of manganese, after four weeks the batteries could not be charged. The addition of silver in water solution of silver nitrate with 0.5 per cent contamination resulted in the immediate precipitation of silver sulphate, short-circuiting the cells and reducing the capacity to 18 per cent normal. An addition of platinum even so slight as 0.00001 per cent caused immediate gassing with greatly reduced capacity. Observations of the voltage characteristics showed that antimony lowered the charge voltage for a few cycles only, while the other impurities, except silver and platinum, showed very little influence.

When considering the self-discharge of the battery and the life of the active material a much more varied behavior is apparent, as may be observed in the table. The self-discharge, or loss of capacity on standing, was determined by allowing the cells to stand after charging for intervals of one day, one week and four weeks respectively before discharge. They were then discharged at the five-hour rate. Since the same relative loss in capacity was observed for each of the periods, the four-week period only is recorded. This is the third column in the table, expressed as percentage of the previously determined capacity of the cell.

EFFECT OF IMPURITIES ON SELF-DISCHARGE AND LIFE OF CELLS

All metallic impurities were added one-half hour before completion of charge. Foreign acids were added with the original electrolyte on assembly of cells.

Impurity Percentage of Electrolyte Weight	Compound in Which Introduced	Percentage Former Capacity After Standing Four Weeks	Life Tests—Performance of Uncontaminated Cells Considered 100 per Cent
Magnesium....0.05	$MgSO_4.7H_2O$	92.5	85.7
....0.5	Sulphuric acid solution	87.9	79.5
Manganese....0.005	$KMnO_4$	62.8	80.8
....0.01	Sulphuric acid	65.4	42.8
....0.025	solution	30.1	*
....0.05		56.5	*
....0.05	Water	†49.2	*
....0.5	solution	† 6.15	*
Zinc.....0.05	$ZnSO_4.7H_2O$	90.0	100.
.....0.5	Water solution	95.5	104.5
Cadmium.....0.05	$CdCl_2.2H_2O$	77.2	110.
....0.5	Water solution	84.1	50.
Iron.....0.01	$FeSO_4.7H_2O$	75.	105.2
.....0.05	Water solution	77.75	92.5
.....0.1		77.4	80.4
Nickel.....0.05	$NiSO_4.6H_2O$	76.8	109.
.....0.5	H_2SO_4 solution	76.8	103.5
Tin.....0.05	Metallic tin	85.5	94.95
.....0.5	dissolved in sulphuric acid	74.4	92.43
Arsenic.....0.05	As_2O_3 dissolved	76.	86.7
.....0.5	in HCl, digested with H_2SO_4 to expel Cl	59.5	86.2
Antimony....0.05	$SbCl_3$ in HCl	71.7	85.5
....0.5	solution	47.3	51.1
Mercury.....0.05	$HgSO_4$	93.5	104.
.....0.5	water solution	92.5	67.75
Silver,			
First test....0.005	$AgNO_3$ in water	74.2	125.6
....0.05	solution	83.9	112.9
....0.5		59.7	97.5
Silver,			
Second test.0.01	$AgNO_3$ Solution	83.	100.
.0.05	digested with	74.3	100.
.0.1	H_2SO_4 to expel	69.6	106.8
.0.5	nitric acid	33.5	89.5
Platinum....0.00001	$PtCl_4.5H_2O$	....	‡48.5
....0.01	Water solution	....	‡16.4
Hydrochloric			
acid.....0.01	HCl	¶	81.28
.....0.05	HCl	¶	86.3
.....0.1	HCl	¶	96.8
.....0.5	HCl	¶	77.25
.....1.0	HCl	¶	47.3
.....5.0	HCl	¶	20.42
Nitric acid....0.1	HNO_3	81.0	100.8
....0.5	HNO_3	84.0	98.8
....1.0	HNO_3	92.5	100.
Acetic acid....0.1	$HC_2H_3O_2$	¶	101.
....0.5	$HC_2H_3O_2$	¶	101.8
....1.0	$HC_2H_3O_2$	¶	98.
....5.0	$HC_2H_3O_2$	¶	36.6

* Cells too low to put in life test.
† After standing one week.
‡ Loss to these figures in six cycles.
¶ Not tested.

The life test consisted of consecutive charges and discharges until the capacity fell to a definite fraction of its former value. Rating the performance of the uncontaminated cells as 100 per cent, the relative performance is tabulated in the last column.

New York. FIELD EDITOR ELECTRICAL WORLD.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Central Stations and Contractor-Dealers Should Pull Together

By H. D. Stokes

Chairman Worcester District, Massachusetts State Association of Electrical Contractor-Dealers, and Power Engineer Worcester Electric Light Company

A DISPOSITION on the part of the contractor-dealer to recognize the functions and logical capabilities of the central-station company is much to be desired in the interests of harmonious working. On the other hand, a willingness on the part of the central-station company to appreciate the contractor's difficulties and to help him make a success of his business is equally essential to the prosperity of these two branches of the electrical industry. It is a privilege to be in a position to see both sides of the fence at the same time, and perhaps it would not be amiss to say here that there should in reality be no fence, no formal line, between the central station and the man who does wiring and sells electrical devices, for both are engaged in electrifying the community to mutual advantage.

The central-station company can well afford to take the leading part in making the contractor busy and prosperous. The latter has no easy job. He meets competition to a degree unknown to the central station, and altogether he has a hard row to hoe. All too real are the difficulties the contractor has to meet in the way of carrying on a merchandising business, in raising capital to maintain stocks of supplies, in handling a class of labor highly susceptible to turnover, and in adapting himself to the requirements of the central station, reasonable though these may be.

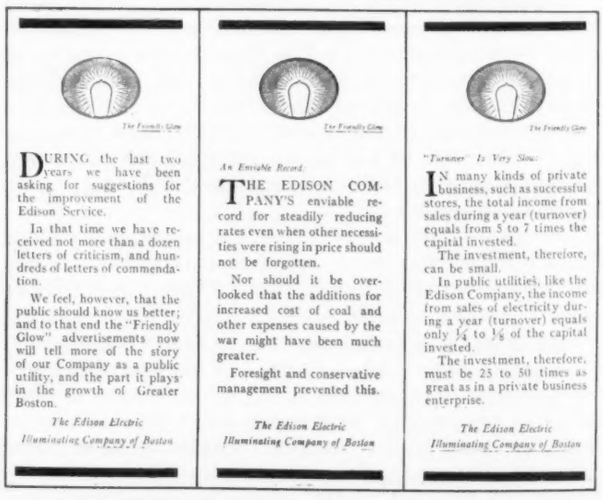
There is a real opportunity for helpfulness in the relation of the central station to the contractor-dealer. Selling appliances at list is a practice that should require no extended argument. By taking the contractor-dealer into our confidence we as central-station men need not give up the idea of selling electrical conveniences in competition with other agencies, but we can at least throw the field open to all on even terms. The pioneering of new and untried devices is peculiarly our province. The sale of fast-moving supplies to the public is the contractor's opportunity as well as the central station's, and, of course, we do not handle wire, armored conductor, loom and many other items of wiring materials of which the contractor usually has exclusive control in small-quantity sales to the man in the street.

Better business methods should be sought by the contractor, and the central station can assist here if it will and if the contractor is disposed to make the most of his opportunities. Through co-operative sales campaigns whole communities can be stimulated toward greater purchases of things electrical. Radio interest offers a common ground upon which to build better and larger local trade. The response of the public to the radio appeal shows clearly enough that both the central station and the contractor-dealer have failed to utilize to the full their mutual opportunities to sell electrical conveniences and service. Now the public is in the retail market talking in electrical terms as never before in the history of our business. To capitalize this willingness to buy, the central station and the contractor-dealer should put behind them all petty jealousies and play the game for all it is worth.

By bringing to the contractor's attention the latest developments in industrial lighting, for instance, aiding him in tests and foot-candle measurements, advising as to outlet locations and other layout points, much good can be done. If the contractor-dealer will on his part get rid of the animosities which sometimes hamper local trade development and if the central station will "go to it" to see that this hard-working brother in the industry has a fair field and every opportunity to "make good," the development in such communities as practice these relations will be of surpassing value.

Boston Edison Company Telling Its Story to the Public

A SERIES of advertisements remarkable for the compact brevity of their message has been started in the press of the Boston metropolitan district by the Edison Electric Illuminating Company of Boston, in harmony with the company's policy of letting the public know the facts regarding its work, service and place in the life of the community. The management has decided that it should clear up many misconceptions on the part of the public of the fundamental relations which exist between public utilities and those whom they serve.



DURING the last two years we have been asking for suggestions for the improvement of the Edison Service.

In that time we have received not more than a dozen letters of criticism, and hundreds of letters of commendation.

We feel, however, that the public should know us better; and to that end the "Friendly Glow" advertisements now will tell more of the story of our Company as a public utility, and the part it plays in the growth of Greater Boston.

The Edison Electric Illuminating Company of Boston

An Enviable Record

THE EDISON COMPANY'S enviable record for steadily reducing rates even when other necessities were rising in price should not be forgotten.

Nor should it be overlooked that the additions for increased cost of coal and other expenses caused by the war might have been much greater.

Foresight and conservative management prevented this.

The Edison Electric Illuminating Company of Boston

"Turnover" Is Very Slow

IN many kinds of private business, such as successful stores, the total income from sales during a year (turnover) equals from 5 to 7 times the capital invested.

The investment, therefore, can be small.

In public utilities, like the Edison Company, the income from sales of electricity during a year (turnover) equals only ¼ to ⅛ of the capital invested.

The investment, therefore, must be 25 to 50 times as great as in a private business enterprise.

The Edison Electric Illuminating Company of Boston

TYPICAL ADVERTISEMENTS IN BOSTON EDISON COMPANY'S "FRIENDLY GLOW" SERIES

For about two years the company has been "running" advertisements under the title "The Friendly

Glow" in the local press, and these have sought constantly to encourage comment and suggestions as to the betterment of service and of public relations through increased contact of customers and others with the company's organization. Criticisms have been welcomed and many good ideas have come to the company from this series, which has previously been reviewed in the ELECTRICAL WORLD. Now, however, the company feels it desirable to go further into the subject of public relations, and it will be seen from the typical advertisements reproduced that even he who runs may read and learn a good deal about the "whys and wherefores" of public utility operation.

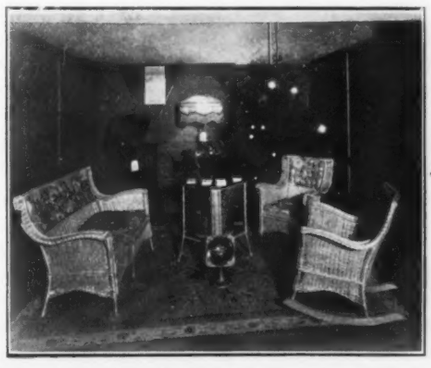
The advertisements which are to follow are designed to tell the company's story in language as simple as possible, to emphasize its management by home people, its ownership by thousands of the general public, and its service activities, aims and achievements. This publicity was originated and is being directed by L. D. Gibbs, superintendent of the company's advertising department.

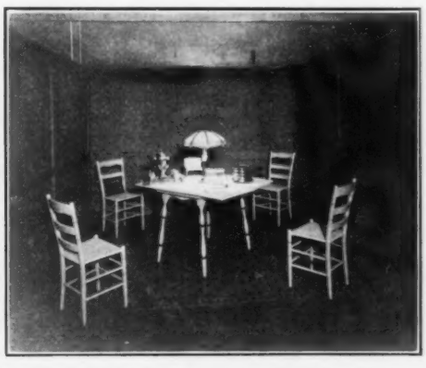
Portable "Home Electric" Demonstration for Scattered Territory

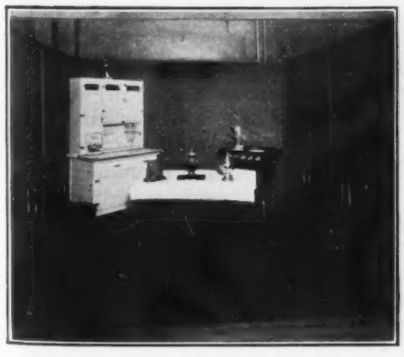
TO BRING the "home electric" idea to the people in the smaller towns served by the Oklahoma Gas & Electric Company, O. A. Jennings, new-business manager of the company, recently instituted a traveling show which could be quickly folded together and transported on a 1-ton Ford truck. Movable sets representing a five-room house were prepared in five days by a stage carpenter of one of the Oklahoma City theaters. Two trunks contained the necessary electrical appliances, banners advertising the show, motion-picture films, stage braces and advertising cuts.

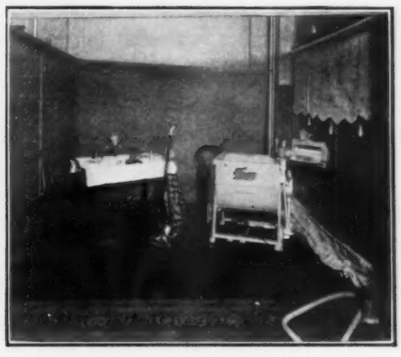
A schedule of the towns to be visited was planned by the divisional manager who arranged the dates and advance advertising in each town and the necessary local representative to sponsor the exhibits. Two representatives from manufacturers of electrical machinery and appliances accompanied the show and assisted in demonstrating the appliances. The show was set up in a school building, hotel lobby or storeroom and remained in each town two days and two nights. Interest was stimulated by distributing electric irons and shaving mugs to the registered holders of lucky numbers. The various chambers of commerce, business men's associations and women's clubs gave their support to the demonstrations.

Publicity was obtained by using the N. E. L. A. film "Back of the Button" and through advertising in the local newspapers. The morning that the show opened 500 handbills were distributed on the main street of the town, the banners were hung up and the appliances and furniture which had been loaned by the local dealers were arranged. Following the show special house-wiring campaigns were announced in the local papers and letters were sent to all the registered names.









VIEWS OF OKLAHOMA GAS & ELECTRIC COMPANY'S FIVE-ROOM PORTABLE "HOME ELECTRIC"

What Other Companies Are Doing

Norman, Okla.—Municipal ownership received another setback when the City Council of Norman at a recent meeting, by a vote of three to one, passed a resolution revoking bonds voted two years ago for the installation of a municipal light plant.

New Orleans, La.—The New Orleans *Times-Picayune's* "home electric" is fast approaching completion. It was expected to be ready for opening by June 4. The best of material and skill are being combined in the building of the house, which will illustrate the ability already acquired by science and craftsmanship to provide the acme of household comfort and convenience. The house is being planned by the *Times-Picayune* in co-operation with New Orleans electrical dealers.

Worcester, Mass.—That business is showing a marked improvement is indicated by the records of the Worcester Electric Light Company's appliance department. For eight successive weeks the gross sales have exceeded those of the corresponding week of the previous year. The sales of the week ended April 29 amounted to $3,609.01, the banner week thus far in 1922. During the month of April, the leading articles that were sold were vacuum cleaners and flatirons, 99 and 147 respectively.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

Waste Elimination Possible in Electric Wiring Devices

By Howard R. Sargent
Manager Wiring Supplies Division, General Electric Company

THEORETICALLY every man in the electrical industry believes in the elimination of waste. The program which Secretary Hoover has instituted in the Department of Commerce has already led to the development of many practical economies in many industries. The United States Chamber of Commerce has given the idea strong support. Its analysis of the savings which may be wrought through reduction in the number of excess varieties in any line was published in the Electrical World recently and is most convincing. There is an excellent opportunity to apply these principles in the electrical industry — one that may well have the consideration and support of every electrical man. For a very real practical service would be rendered to manufacturers, jobbers, contractor-dealers, fixture manufacturers and the public as a whole if the line of wiring supplies could be simplified.

H. R. SARGENT

We have on our list about 3,500 catalog numbers. These devices have about fifteen parts upon which an average of five operations have been performed, in addition to the many operations connected with assembling, testing, packing and so on. It will be appreciated, therefore, that if a standard line of devices could be established which fulfilled all practical applications, considerable economies would result not only in manufacturing but in stocking and distributing. To be specific, I may mention a few examples. They are found in the various lines of sockets which any manufacturer who puts out what might be termed a complete line is obliged to carry.

Unnecessary Sizes

It would seem that the $\frac{1}{4}$-in. and $\frac{3}{8}$-in. caps would take care of all conditions and that the $\frac{1}{2}$-in. and $\frac{3}{4}$-in. sizes could be eliminated. This would effect a saving of a great many devices, yet they continue to be made because the trade orders them. The rubber-ring sockets were condemned by the underwriters many years ago, but there is still a limited demand for these which is being met, although it could with advantage be switched to the more standard sockets.

In the receptacle line there are the wooden molding devices, which could be well done away with. There are also the receptacles for pancake bases without porcelain rim. These could be abolished as the porcelain rim is very thin and inconspicuous and there are many porcelain receptacles of the cleat type which practically duplicate them, merely differing in the spacing of the wires. Yet people buy them and they continue to be made. The sign receptacle line is also capable of considerable reduction.

Then, when we arrive at snap switches, the code states that they must be installed with sub-base for cleat wiring, and it would therefore be logical to suppose that all of the switches having slots for the wires in the bases could be eliminated and we could standardize on one line of solid-base switches. But the habits of the trade have not made it possible.

A further reduction could be made in cutting out either the miniature or one of the larger-size base lines of snap switches. These two changes would also put an end to a very large number of devices and would not penalize the market in any way whatsoever.

Benefits of Standardization

There are in addition many different types of convenience outlets which have been on the market for many years but are in very little demand and could be eliminated in view of the standardization of the parallel-blade plug.

The link-fuse ceiling rosette also could be abandoned without working any hardship. When we come to the inclosed-fuse situation, we have all of the ampere capacities from 1 amp. to 12 amp., and it is readily seen that at least six or seven of these could be cut out without affecting the protection of other equipment.

I have mentioned a few of the places where economy could be effected, but, of course, the method of bringing this about is a horse of another color. There can be no agreement among manufacturers to manufacture only certain lines of goods, and it is, of course, only human nature to continue to manufacture material for which there is a continued demand; therefore, even though a manufacturer might think it wise to curtail his line, the demand would still exist and other manufacturers would continue to produce the material and sell it if he did not. So he keeps on.

The distributers and contractor-dealers have it in their power to influence the situation greatly by purchasing only the goods which are essential, or, rather, by avoiding the purchase and sale of lines that duplicate more vital stock, thereby reducing expense through less handling, purchases and shipments in larger quantity and less inventory work, with the possibility of lower prices as a result of the economies such a practice would bring in the processes of manufacture. For if the distributer ceased to buy and sell these excess lines, they would soon be abandoned.

It will be very difficult for the manufacturers of electrical wiring devices themselves to bring about an effec-

tive elimination of waste through a reduction in the number of varieties. But if the jobber, the contractor and the industrial plant will habitually purchase the varieties that have become popular through their inherent advantages and avoid other slightly dissimilar varieties, these duplicating lines will soon languish and disappear from stocks and from the factories.

The Jobbing Craze Among Dealers

BY A MANUFACTURER

IT IS surprising the number of electrical dealers who want to be and are trying to be jobbers. This situation is true in small towns as well as in the larger cities. Just why this condition exists I do not know unless the electrical dealers are beginning to think along the line of many other retailers, that the jobber does not function properly. The dealer wants to buy direct. There are several reasons for this. Many electrical household specialties are being sold direct to the dealer, and it looks as though more and more are going to adopt this policy, especially manufacturers of the larger items, washers, ironers, cleaners, etc. This gives the dealer the idea of buying *all* merchandise direct.

In many cases this dealer wants to be a jobber because a cleaner manufacturer, for instance, gave him a little more than the necessary retail profit—no doubt to help him promote the sale of his product—but he believes he can afford to sell it to other smaller dealers and make a fair profit and increase his volume for better discount.

There is another situation that is causing this jobber's craze. Take the Jones Electric Washing Machine Manufacturing Company. It has a good product and is doing fairly well in some territories. The officials then decide to expand and find that in many territories, and in large cities, they cannot sell through the recognized jobbing outlets for they already have Brown's and Smith's washers. So Jones does the next best thing—in his estimation—and places his washer with the largest and livest dealer in that city, giving him jobber's discount in order to get his line in, giving him limited territory and causing him to believe he has a fine thing and is a jobber now.

Having obtained this special price on one article the dealer thinks, "Well, why can't I do like the other jobbers—let the retailer do the work?" So he conceives the idea of getting a number of small dealers all through his limited territory to sell washers for him, he making a profit on their efforts. This sounds good, but in my estimation it is the beginning of the end for a good, thriving electrical dealer. He becomes so enthusiastic about being a jobber—being in big business—that he gives all his time to promoting his jobbing interests and of necessity neglects his retail business, which begins to go down for lack of the old interest. Besides, buying in wholesale quantities and carrying small dealers' accounts strains his financial standing and may result in failure of his retail store. If this happens, he finds himself on a jobbing basis with only a few items in a restricted territory, not enough to make it a real worth-while jobbing proposition, and another retailer—a thing so necessary in the electrical game today—is out of business. If this keeps up, of course, there will be too many jobbers compared with the sales possibilities, and a large percentage of failures will result.

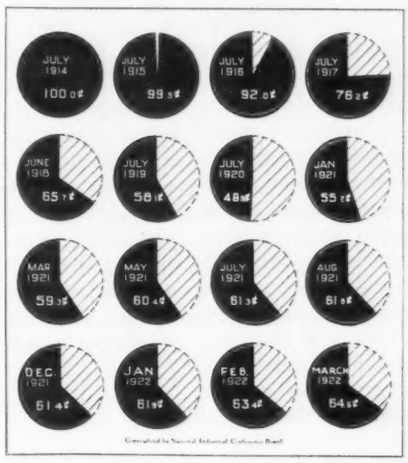
To a certain extent the jobbers themselves are responsible for this jobbing craze among dealers. If a dealer shows activity and begins to go out and sell to the curbstoner—the purchaser of one or two flatirons—making a very small profit, but selling to the little fellow the jobber does not reach, or to small industrial plants, the jobber makes him a so-called sub-jobber, giving him just a little better than the maximum dealer's discount. This sub-jobber then with this start builds a fair volume of business—perhaps owing to the lack of aggressiveness and fine-tooth-comb selling by the jobber—and then with this start the sub-jobber goes to the manufacturer for a jobbing arrangement direct. He has built up only a fair volume, but it is all his. He alone knows where it is going, and the manufacturer is tempted to take him on and keep the volume he has built up for him. If he turns him down, his competitor is very apt to jump at the chance to add this volume to his sales, and he usually gets some line or other. This is not theory—I have actually seen it worked out.

Another way the dealer gets his sub-jobber start arises from the policy of so many jobbers who travel out of their own natural geographical territory. It is always hard to sell in foreign fields. The salesman runs against so many natural obstacles that he meets them with price and freight allowances. The jobber usually thinks this business is all velvet, and, inasmuch as he only hits the larger towns, the high spots, he really does not object to this sub-jobbing business just outside of his own territory, for he would not get this small-dealer business any other way.

If the jobbers would discontinue this "far-distance traveling" and the special price deals, they would not have so much cause for complaint on their profit. If they would make more effort in their natural distributing territory, they could, I believe, increase their volume and make a better percentage of profit as well as a larger net profit. In other words, by trying to cover too much territory the jobber defeats his own ends.

I understand that the hardware business has gone through the same stage we are now entering in the electrical industry, but that the many small hardware jobbers did not continue in business. Some failed, some returned to the retail business, and a few held on. Are we coming to this period and condition in the electrical industry?

The Increased Purchasing Power of the Dollar



FEW people realize that the value of the dollar has risen 32.1 per cent since its low point of 48.9 cents in July, 1920. This diagram is based on the cost of living and provides a bit of evidence that may be of interest to men who still continue to "talk poor."

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Asynchronous Start of Synchronous Machines.—A. BÖHM.—The theory of synchronizing machines which are started asynchronously is derived in this article, and a relation is shown whereby the necessary exciting current is proportional to the square of the starting torque, to the square of the slip and to the first power of the moment of inertia. For difficult starting conditions due to high starting load and a high moment of inertia it is recommended that the machine be not started with direct current, but by exciting the rotor with alternating current of the slip frequency, taking the excitation from the exciter, which is built and connected as a frequency changer. Connection diagrams and oscillograms for both methods are given.—*Elektrotechnische Zeitschrift,* March 30, 1922.

The Size Factor in Steam Turbines.—A study of the factors affecting the size of rotor in steam turbines, such as bending stresses on the shaft, output, speeds, "whipping" and the dead weight of the rotor.—*Engineering,* March 31, 1922.

Development of the High-Frequency Generator in Russia.—V. WOLOGDIN.—Up to 1915 the author built for radio operation 20,000-cycle generators based on a somewhat altered Alexanderson principle, in capacities of 2, 3 and 6 kw. In spite of almost insurmountable difficulties in obtaining the necessary raw materials, a 50 kw., 20,000-cycle generator was finished during 1916 and gave good service in actual radio work. A 150-kw., 15,000-cycle generator for 3,000 r.p.m. has been completed successfully, the frequency being stepped up to 30,000 cycles in a stationary transformer. Work has been started on a 500-kw., 12,500-cycle machine.—*Elektrotechnische Zeitschrift,* March 30, 1922.

Starting and Operating Polyphase Induction Motors —LEROY A. FRANCIS.—Methods of starting and operating polyphase induction motors by connecting them directly to the line, by inserting internal resistance in the rotor circuit and by inserting external resistance in the rotor circuit are described in the first part of the article appearing in the December issue. In the second article the author takes up the starting of polyphase motors by the star-delta method, by the use of a transformer having low-voltage taps and by the use of a compensator.—*Electrical Record,* March, 1922.

Lamps and Lighting

Merchandising Illumination.—W. L. GOODWIN.—The author points out the need for applying illuminating engineering knowledge and skill to a larger proportion of the lighting installations now being made. The whole lighting industry must help to make illumination selling and illuminating engineering profitable in a money sense. The giving of free engineering service is a fundamental error of policy which has the result of closing up the field of the independent consulting illuminating engineer. So important and varied are the applications of electric lighting that almost any plan or scheme to bring them into general use by the public would be justified. An illumination merchandising plan is outlined in which proved methods have been adopted and applied.—*Transactions of the Illuminating Engineering Society,* April, 1922.

Generation, Transmission and Distribution

Safety Factors for Different Types of Suspension Insulators.—P. TESTARD.—The different problems which present themselves in making a choice of the best type of chain insulators are mentioned in a general way in this paper. The commonly demanded mechanical safety factor of five is considered too high. A factor of two and one-half to three is held to be ample. As an electrical test the author suggests use of the ratio between the puncture of the disk under oil and the dry flashover in air. This ratio should not be less than two and one-half for normal frequency and not less than two for high-frequency tests. This safety factor and the mechanical safety factor suggested above are of about equal importance. Most types of these insulators show a premature mechanical decay due to cracks which develop at certain sections of the porcelain disk. This the author ascribes to the different amounts of compression in the different parts of the porcelain during the molding process. One type of insulator (denoted as C below) was tested which avoids this fault. Three models of disks have been tested carefully, and the following results were found:

Type	Dry-Test Voltage, Kv.	Puncture in Oil, Kv.	Safety Factor Electrical	Safety Factor Mechanical
A	67	75	1.08	2.68
B	70	105	1.43	3.0
C	85	200	2.12	2.4

Taking the average of electrical and mechanical safety, it is seen that the type C insulator gives the most satisfactory performance. The further fact that this type is being made in France is emphasized as an incentive to more general use of this insulator on French lines.—*Revue Générale de l'Electricité,* March 18, 1922.

Water Purification for Boiler Feed.—F. J. CROLIUS. —A consideration of the water side of boilers with particular reference to the cost of water treatment by various methods.—*National Engineer,* April 1922.

Present Status of the Overvoltage Problem.—J. BIERMANNS.—After discussing the nature and behavior of what are called in general overvoltage phenomena on high-voltage lines, the author describes the various forms of present-day protective devices.—*Elektrotechnische Zeitschrift,* March 9 and 16, 1922.

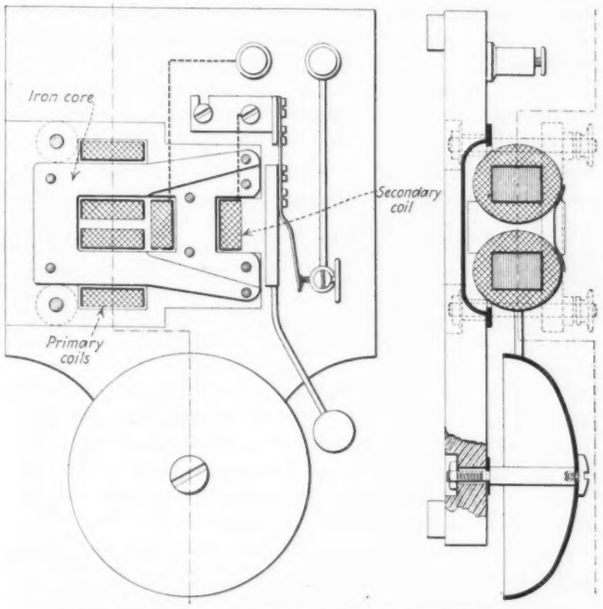
Graphic Solution of Alternating-Current Load Problems.—J. A. VAN TILBURG.—A graphic means for solving the various problems arising in daily alternating-current practice is described by the author. Seven examples are given, among which one is the addition

of two inductive loads to a circuit, another is the addition of non-inductive to inductive loads, and a third is the addition of inductive load with lagging power factor to a load with leading power factor. He also gives specific examples of its application.—*Electric Review (London)*, March 31, 1922.

Development in Power-Station Design.—In this section of a continued series of articles the design of condensers and their auxiliaries is considered. A scheme is described for a condenser plant forming a complete condensing, make-up and feed-heating system.—*Engineer (London)*, March 31, 1922.

Installations, Systems and Appliances

Doorbell with Built-in Transformer.—M. KERBAKER.—This contrivance is a combination of a bell-ringing transformer and a bell and is suitable for operation on any alternating light circuit. On a peculiarly shaped iron core there are placed two high-voltage coils connected permanently to the light circuit and one 4-volt to 5-volt coil, the ends of which are carried over the self-interrupter of the bell to the push-button.



NO-LOAD ENERGY LOSS OF BUILT-IN BELL TRANSFORMER ONE-HALF THAT OF BELL-RINGING TRANSFORMER

Complete data are given for the dimensions of the core and for winding such a bell. To guard against overheating due to a short circuit in the low-voltage wiring, a strip of low-melting metal is used as connection between the two high-voltage coils.—*Elektrotechnik und Maschinenbau*, April 23, 1922.

Fitting the Electric Motor to the Machine in the Rubber Industry.—This is the first of a series of articles that will deal with the application of electric motors in the various industries. In the present one the motor requirements for basic operations in the rubber industry are explained. Other points taken up are the selection of motor voltage and size, intermediate-process power applications, the control of calenders, source of power for calender operation, and motor requirements in finishing process.—*Electrical Record*, April, 1922.

Electric Crane Controllers.—J. F. SCHNABEL.—The author discusses the character of the controllers best suited for trolleys and hoists under various conditions. The paper also deals fully with the problems concerning the selection of ohmic values for the resistors and covers very completely the connection arrangements and resistance values involved in the dynamic braking control of lowering loads.—*Journal of the A. I. E. E.*, April, 1922.

Hydraulic Equipment as Affecting Power-House Design.—MA . V. SAUER.—A paper read at a water-power symposium at the University of Toronto on the improvement of hydraulic equipment. Present tendencies show a marked increase in turbine efficiency. Various features affecting installation of main units and auxiliary equipment are described.—*Canadian Engineer* March 7, 1922.

Hydro-Electric Possibilities in the Dutch East Indies.—According to the third annual report of the official water-power and electric power supply administration of the Dutch East Indies, a careful survey of all existing water powers rated at over 1,000 hp. shows that there are available, on Java 302,850 hp., on Sumatra 1,198,400 hp., on Celebes 498,000 hp. and on Borneo 375,000 hp. There are at present in operation or in the state of erection on Java plants rated at 47,050 hp. and on the other islands combined plants rated at 2,000 hp. A lease for the use of 200,000 hp. for the erection of a large nitrate plant on Sumatra and one for 50,000 hp. for another nitrate plant on Java have been granted to two Dutch companies. Three-phase current of from 2,000 volts to 12,000 volts is used now, but the newly planned high-power stations are to use 70,000 volts and 110,000 volts. The Dutch East Indies, with their dense population (Java is more densely populated than China), their large water-power resources and their great riches in minerals and fertile lands, should offer a great market for American machinery, although all existing plants are of Dutch origin.—*Third Annual Report of the Official Hydro-Electric Power Administration of the Dutch East Indies.*

Traction

Roller Bearings for Traction Motors.—H. MECKE.—Experience with ball bearings on various kinds of motors dates back twenty years and has resulted in the design of very serviceable bearings even for motors of heavy duty. For heavy-duty and large traction motors roller bearings are preferable. The roll gives in addition a broader contact surface and a mechanical stress always at right angles to the direction of the fiber. Greater efficiency of the motors, dependable service, smaller permissible air gap and great savings in the lubrication are among the chief advantages claimed for roller bearings on traction motors. The article contains ten drawings of different types of ball bearings and twelve constructions of roller bearings.—*Zeitschrift des Vereines Deutscher Ingenieure*, March 25, 1922.

Electrification of Industrial Plant Railways.—D. M. PETTY.—The author discusses the advantages of five methods of supplying the current to the motors on the locomotives. These methods are (a) overhead trolley system, (b) third rail, (c) contact system, (d) storage batteries, and (e) a combination of storage batteries and one of the other four. He also describes substations and recommends a voltage to be used.—*Paper presented before the Association of Iron and Steel Electrical Engineers*, March, 1922.

Rectifiers Used on a Large Scale in Europe.—K. BALLY.—A very rapid increase in the use of large mercury-arc rectifiers can be noticed in Europe. Today there are in operation 175 plants, with a total rating of 93,000 kw., built and installed by one company alone. The highest direct-current voltage is 1,700, and the largest single output is 1,200 kw. To demonstrate ability to withstand a sudden heavy short circuit, a test was made on an 1,800-volt direct-current rectifier, the oscillogram of which is reproduced. The calibration of the oscillogram revealed a short-circuit output of 36,500 kva., which was opened through a guide break switch. The satisfactory operation of the rectifier was not affected by this test. Comparing the operating cost of a rotary converter with an equivalent rectifier, annual savings as high as 10 per cent of the initial installation cost are not uncommon. Several interesting photos of existing plants accompany the article.—*Brown-Boveri Mitteilungen*, April, 1922.

Electrophysics and Magnetism

Sound-Proof Partitions.—F. R. WATSON.—The demand for quiet rooms in hospitals, hotels and office buildings, the desirability of insulating music studios and other rooms where disturbing sounds are produced, and the necessity for solving other problems for the control of noise, have led to repeated requests from architects and builders for reliable information on effective methods for insulating sound. Although present knowledge of the subject is incomplete, nevertheless, on account of the pressing need for guidance in such matters, the author has collected the available information in a systematic way, giving the methods and results of various investigations relating to the action of materials and sound, describing practical sound-proofing installations and setting forth in accordance with existing knowledge recommendations that may be applied where sound insulation is wanted. Although many things may be learned from further experience and much may be gained from additional theory, enough has been revealed to give encouragement to the belief that sound-proofing may be undertaken in the future with some of the certainty that now attends the acoustic design of auditoriums.—*Bulletin No. 127, University of Illinois.*

Units, Measurements and Instruments

Development of Meters Since the War.—K. SCHMIEDEL.—A great number of improvements and new designs of alternating-current induction meters have been introduced into Germany since the war, aiming principally at the smallest energy consumption and highest accuracy under widely varying load. The author deplores the lack of much-needed improvements on direct-current meters. The paper contains fifteen drawings and photographs of new meter models of different concerns.—*Zeitschrift des Vereines Deutscher Ingenieure*, April 1, 1922.

High-Voltage Electric Meter with Fault Indicator.—A. KAEPPELE.—If electric meters are used on high-voltage lines and current and potential transformers are interposed between the line and the meter, it happens quite often that one of the fuses on the potential transformer either burns out or falls out of its contacts. Under this condition the indications of the meter might be as much as 70 per cent too small. Such a fault is not obvious to the meter reader, and it may be months before the accounting office discovers the discrepancy. The author has patented an arrangement whereby two auxiliary windings are placed over the existing potential coils of the meter mechanism. These feed two miniature low-voltage lamps, which can be switched on simultaneously and for an instant only by means of a push-button inaccessible to the customer. Unless the connections are in perfect condition these two lights will not burn with equal brightness.—*Elektrotechnische Zeitschrift*, March 9, 1922.

Electrochemistry and Batteries

Manufacture of Electrolytic Iron.—G. F. MCMAHON.—General data for a commercial plant manufacturing pure iron for electrical purposes are given. The effects of composition, temperature and circulation of the electrolyte upon the physical properties of the deposited metal were investigated and the results given.—*Chemical and Metallurgical Engineering*, April 5, 1922.

Hydrogen Overvoltage and Current Density in the Electrodeposition of Zinc.—U. C. TAINTON.—The overvoltage of the alloys examined lies between the overvoltages of their constituents. In the case of zinc deposits containing impurities the overvoltage is very high as long as the zinc surface is clean and growing. However, the overvoltage of an impure, corroded zinc surface is found to be very low, and so once corrosion begins it tends continually to spread.—*Paper presented before the American Electrochemical Society, Baltimore*, April 27, 1922.

Telegraphy, Telephony and Signals

The Thermionic Triode as Rectifier.—E. B. MOULLIN and L. B. TURNER.—The performance of the triode rectifier arrangements used in wireless telegraphy with signals of various strength and with or without a superimposed local heterodyne oscillation are investigated theoretically and experimentally. The results are illustrated numerically by reference to a well-known pattern of triode, and in the more fundamental cases the theoretical deductions are compared with precise experimental measurements made at low frequency. The agreement is found to be very close.—*Electrician (London)*, April 14, 1922.

Radio-Telegraphic Antennas of Airships.—ALGERI MARINO.—The substantial difference between aëronautic antennas and those used on land and on sea are treated mathematically and graphically, the electrical and magnetic fields and the relative effects coming in for examination.—*L'Elettrotecnica*, April 15, 1922.

Miscellaneous

The Cost of Plowing.—A. DELMAREE.—The author gives the detailed costs of plowing fields by means of horsepower, ox power, gasoline tractor and electric power. The electric method is found to be the cheapest especially if deep plowing (35 cm.) is done. For light work, such as cultivation and plowing only about 18 cm. to 22 cm. in depth, the difference is small. The accompanying tabulation, based on present French costs, is of interest.—*Revue Générale de l'Electricité*, March 18, 1922.

ELECTRIC PLOWING CHEAPEST FOR HEAVY WORK

Depth of Furrow	Horses	Oxen	Gasoline Tractor	Electric Power at 0.70 Franc per Kw.-hr.
18 cm. to 22 cm., francs	203	147	134 to 142	130
30 cm. to 35 cm., francs (for wheat)	403	291	....	150

New Books

Reviews of the latest contributions to technical, industrial and commercial literature of particular interest to members of the electrical industry.

AMERICA'S POWER RESOURCES. By Chester G. Gilbert and Joseph E. Pogue. New York: The Century Company. 326 pages.

A monograph like this, devoted to a study of the economic significance of coal, oil, natural gas and water power, must command the deep interest of every engineer; and back of the professions lie the great public utilities whose very existence depends on the proper employment of the raw material out of which power is manufactured. Taking as apparently quite well founded the assertion of the authors that it would require the labor of three billion hard-working slaves to accomplish the service received annually by the United States from our energy resources, the startling result is reached that every man, woman and child in this country enjoys through the utilities in some form the work of about thirty servants. As the average family is about four persons, this figures out at in excess of more than a hundred servants per family. There is an enormous waste in all this, just as there was in slavery and is now in all industrial activities and in household operations. Herbert Hoover in his stirring protests against such waste is still merely a vociferous prophet unheeded in the wilderness of extravagance. This book is a magnificent "alarum" in support of his vaticinations on economy and how to go after it—or perish!

PRACTICAL ELECTRICAL ENGINEERING—DIRECT CURRENTS. By Harry G. Cisin. New York: D. Van Nostrand Company. 305 pages, 68 illustrations.

The keynote of this book is simplicity, the basic principles of direct-current electrical engineering being presented without the use of symbols or algebra. First the fundamental units are defined, then the underlying laws and properties of electric and magnetic circuits are explained, and finally the construction and operation of various types of apparatus are discussed. The book is in such form that it is especially suitable for elementary courses in industrial or evening schools and also for home study.

ELEKTRISCHE FÖRDERMASCHINEN. By Prof. W. Philippi. Leipzig: S. Hirzel. 304 pages, 136 illustrations.

It may be said that in the development of the large electric mine hoist a degree of standardization has been attained. The Leonard system, with or without a flywheel, has definitely established its superiority over any other system for heavy hauls. For a medium load, however, it is still necessary to study each individual case in order to find the most satisfactory solution. Moreover, the economical comparison between steam and electric drive has, to a certain extent, reached a definite state. The experience of the last twenty years has at least shown the limits of the controversy and has restricted the field of argument. In preliminary consideration electric drive has always the great advantage of permitting an exact calculation of the operating cost. The book is divided into thirteen chapters, dealing with the mechanical parts, the characteristics of the different suitable electric motors, the best arrangement of the electric parts, the calculation of the hoists and their controlling machinery, advantages of electric drive, energy consumption, questions of economy, and the detailed description of two typical hoists, one in Germany and one in Holland. The chapter on the calculation of mine hoists is very elaborate and contains a large number of actual examples to illustrate concretely the author's theories.

TECNICA DEGLI IMPIANTI ELETTRICI PER LUCE E FORZA. By Emilio Piazzoli. Milan: Ulrico Hoepli. Seventh edition. First volume. 700 pages, 321 illustrations.

The first of the two handbooks which compose this treatise now appears in its seventh edition, brought up to date and enlarged by the author. His principal purpose is to give to practicing engineers a complete and comprehensive handbook to which they can refer for the solution of everyday problems. The first volume is divided into seven chapters, the first two of which deal with symbols, units and fundamental principals of electricity and their applications and are completed by tables and other useful data. The other five give a detailed account, from a practical standpoint, of the principles and use of metering instruments, motors, dynamos, transformers and batteries, and of their construction, installation, test and operation. The author's sound technical knowledge and his wide experience in the construction and operating fields, which gave him opportunity to investigate a great number of problems, made it possible for him to illustrate the different chapters with examples and notes based on first-hand experience. For this reason the volume is exceptionally interesting and comprehensive. The other volume, which will soon be published, will contain nine chapters dealing with their subject in the same comprehensive way.

PROTECTIVE RELAYS. By Victor H. Todd. New York: McGraw-Hill Book Company, Inc. 264 pages, illustrated.

There has long been need of a textbook on relay practice, and this volume therefore is a welcome contribution to technical literature. Starting with the first principles of relay protection, the author describes the various types of commercial relays and accessory apparatus and then discusses their application to motors, transformers, generators and transmission and distribution circuits. Special attention is devoted to the protection of parallel, radial-ring and network systems. Two chapters deal with tests of direct-current and alternating-current relays, but we hope that in the next edition of the book the author will give more space to this subject as well as to handling some of the operating problems that arise with the use of relays. Methods of determining the settings for relays might also be more extensively discussed to advantage, since the application and operating problems are very much more important than the construction of apparatus. None the less, the information contained so far excels any previous compilation that the book deserves to be in every electrical engineer's library.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Generators Rated at 65,000 Kva. for Niagara Falls Power Company

THE Niagara Falls Power Company has placed an order with the General Electric Company for two 65,000-kva., 12,000-volt vertical waterwheel generators, the largest ever built, to be used in an extension to the generating company's power house No. 3, at Niagara Falls, New York.

These generators will be driven by 70,000-hp. hydraulic turbines made by the I. P. Morris department of the William Cramp & Sons Ship & Engine Building Company, Philadelphia. Each generator will weigh about 700 tons and is to be 35 ft. in diameter and 26 ft. high. It is interesting to note that the new generators are twice the capacity of the three 32,500-kva. generators now contained in Station No. 3, which at the time of their installation were considered the largest in existence.

Hartford Has First Commercial Mercury Turbine Installation

PIONEER developments are again bringing the Hartford (Conn.) Electric Light Company into the center of the engineering stage, arrangements having been agreed upon with the General Electric Company for the immediate installation at Hartford of the first commercial mercury boiler and turbine plant in the world. To a representative of the ELECTRICAL WORLD T. H. Soren, vice-president of the Hartford company, stated last week that the company is installing a complete unit of about 2,000-kva. capacity at the Dutch Point generating station, and that this installation will be provided with every facility for analyzing its performance. Fuel oil will be burned and will be weighed instead of measured; recording instruments will be installed to enable the energy consumption of auxiliaries to be studied, and feed water and other items will be measured. The equipment is housed in a 26-ft. x 45-ft. structure now being erected by Stone & Webster outside the plant proper. It is hoped to cut down the fuel consumption per kilowatt-hour by approximately 50 per cent through the use of the mercury turbine and utilization in steam production of heat given up in the mercury condensation process.

The general arrangement of the apparatus is to install a 2,000-kva. mercury turbo-generator on the top of an oil-fired mercury boiler containing a charge of about 30,000 lb. of mercury. The mercury vapor at rather low pressure operates the turbine. The exhaust from the mercury turbine produces steam in a modified water boiler, and this steam will be introduced into the steam lines of the plant.

It is understood that the company is prepared to expend about $250,000 in this installation. William Le Roy Emmet of the General Electric Company will have charge of the development from the manufacturer's standpoint, and Mr. Soren will share in the investigation and installation on behalf of the Hartford company.

Keen Competition for Niagara Power Foreshadowed in New Application

THE American Superpower Corporation, which represents substantially the same interests as those which were behind the Niagara Power & Development Company, has applied to the Federal Power Commission for a preliminary permit covering the use of 12,000 cu.ft. per second, or one-half the additional diversion of water in the Niagara River recommended by the Board of Engineers. The application was filed with the distinct understanding that no action whatever would be taken on it until after the additional diversion shall have been arranged. It is thought the application was made solely for legal purposes in connection with the controversy between the federal government and the State of New York over the water-power act.

The application proposes the construction of a transmission line from Lewiston, in Niagara County, to Yonkers, where connections would be made with lines supplying New York City. The estimated cost is $27,457,000. The power canal from La Salle to Lewiston is, by the provisions of the application, to be made available for water transportation and, in addition, a waterway is to be made possible from the upper Niagara River to the lower Niagara River.

The applicant proposes to construct an open-prism canal 62½ ft. wide with 40 ft. of water and suggests the use of this canal for navigation purposes. It estimates that $34,188,000 will be required for the construction of the works necessary for the generation of 450,000 hp., under a head of 301 ft. at 88 per cent efficiency. The power house would be equipped with nine units of 50,000 hp., to be stepped up to 110,000 volts for local distribution and to 220,000 volts for transmission to New York. The power taken from the line at intermediate points would be stepped down to the required voltage. The transmission line to New York would consist of four circuits, each capable of carrying 75,000 kw. at 220,000 volts, three-phase, 60 cycles. There would be two independent lines on a right of way 350 ft. wide.

The chief engineer of the Superpower Corporation is Frederick W. Ballard of Cleveland. The officers and directors of the new company are as follows: President, Edward C. Randall of Buffalo; vice-president, Paul T. Brady of the Westinghouse Electric & Manufacturing Company of New York City; directors, Floyd C. Furlow, president of the Otis Elevator Company of New York; Richard W. Gardner, vice-president of the Otis Elevator Company of New York; J. Boardman Scovell of Lewiston. and A. M. Layton of Buffalo.

This application competes with one already filed by

Col. Hugh L. Cooper and other interests, but differs in constructional features. Colonel Cooper proposes to use an underground tunnel for the water instead of the open canal.

Indications are favorable for action on the new diversion treaty with Canada before the year is out, and Eastern power and light interests are watching developments closely.

Laboratory Glassware Will Not Be Placed on the Free List

THAT any effort to place laboratory glassware on the free list is foredoomed to failure is indicated by the vote in the Senate on May 31, when an amendment by Senator Jones of New Mexico attempting to reduce the duty from 75 per cent ad valorem to 45 per cent ad valorem was rejected by the decisive vote of 40 to 26. Only committee amendments are being considered at this time. It is probable that amendments will be brought forward later in the consideration of the bill which will propose reductions in the duty on this item. In view of the vote already taken, it is very generally conceded that the 75 per cent rate will stand.

Secretary Hoover's Efforts to Keep Coal Prices Down Bear Fruit

NEW proof of Secretary Hoover's ability to get results is had in his handling of the coal price situation. When the operators gathered for the general price conference on May 31 there was a minority among them which did not look with favor on the plan of applying the Garfield scale to their free coal when most of their output is moving on low-priced contracts. The opposition, however, was won over by Mr. Hoover.

Operators controlling nearly 85 per cent of the output in the bituminous producing fields, Mr. Hoover said, after the conference, have agreed to accept $3.50 a ton for run-of-mine coal as a maximum, with differentials fixed according to the Garfield plan.

Operators of non-union mines and other producing mines who have been at Washington in consultation with Secretary Hoover have asserted that when the demand comes they probably can deliver 6,000,000 tons or more of coal each week. Should business activities continue to advance on the present scale, this, even in addition to the coal in storage, would not meet the requirements but would, it is thought, prevent a crisis.

On Monday of this week retail coal dealers, as represented by officers of the National Retail Coal Dealers' Association, met Mr. Hoover at Washington and were asked by him to co-operate in an effort to keep down the price of coal to the consumer when the pinch caused by the strike is felt.

In a report made to the Senate Secretary Hoover stated that all efforts on the part of the government to bring about negotiations looking to a settlement of the coal strike had failed; that stocks of bituminous coal on hand had been reduced to about 32,000,000 tons, with an additional 10,000,000 tons in transit, and that while steps taken by the administration to prevent prices to the consumer from soaring to panic levels had been successful in part, the government was without power to use other than moral suasion to handle the situation.

House Committee Reports Bills Favoring Ford's Muscle Shoals Offer

ALTHOUGH Henry Ford refused to eliminate the Gorgas steam plant from his offer for the government's Muscle Shoals property, the majority of the House committee on military affairs decided to report a bill for the acceptance of his offer with the Gorgas plant omitted and with certain changes in the language relating to the manufacture of fertilizers, these changes having been agreed upon with Mr. Ford's representatives. Two bills proposing the acceptance of the Ford offer are to be introduced, one by Representative Wright of Georgia, a member of the committee, but acting independently of the minority, and the other by Representative Almon of Alabama, in whose district the property is located.

The Senate on Friday of last week passed the army appropriation bill with an amendment carrying $7,500,000 for a continuation of the work on Dam No. 2 of the Muscle Shoals project. Mr. Almon's bill provides that the House shall concur in this appropriation.

As the ELECTRICAL WORLD goes to press, its Washington representative telegraphs expressing the view that the Muscle Shoals project is not likely to come up again, unless incidentally, on the floor of the Senate this session. If the House concurs in the appropriation for a continuation of the work on the Wilson Dam, this will shelve the whole question until next session, when the various offers for the project will have to be taken up anew. It is by no means certain that Mr. Ford would accept the bill eliminating the Gorgas plant, even though his representatives have agreed to the fertilizer clause in this bill.

The House committee is split into three parts—the technical majority, with a presumable vote of twelve members; the nine Republicans who oppose the Ford offer, and the minority group headed by Representative Wright of Georgia who favor its unconditional acceptance. The report of the committee will probably be ready by Monday, but unless a special rule can be had from the rules committee it is unlikely that it will ever be reached on the calendar, and the session may end without any action.

Negotiations between the Alabama Power Company and the War Department for the purchase for $2,500,000 of the government interest in the Gorgas steam plant are continuing, and members of the military committee who voted to exclude the Gorgas plant from the Ford proposals are pointing out that this tender for this one plant item is half of the $5,000,000 Mr. Ford is offering for all of the government's properties.

State Attorneys-General Asked to Discuss Constitutionality of Power Act

THE Attorney-General of New York State has issued invitations to attorneys-general of all the states of the Union to meet at Albany at a date in July to be set later to discuss contentions as to the constitutionality of the act which set up the Federal Power Commission. With the invitations he also sent copies of the bill of complaint which he has filed with the United States Supreme Court. The court has granted a motion in his behalf which will permit him to bring an original action to test the law's constitutionality.

Amplification of 300,000 Claimed for New Super-Regenerative Circuit

A NEW process of amplifying incoming radio impulses, using only two tubes and securing an amplification up to 300,000 times the strength of the impressed emf., was described and demonstrated by Edwin H. Armstrong at a meeting of the Institute of Radio Engineers Wednesday evening in New York The principle of operation of this new circuit, which was classed as "super-regenerative" by the inventor, is based on the free oscillation, which is quantitative and without a lower limit. It has been discovered that if a periodic variation be introduced in the relation between the negative and positive resistances of a circuit containing inductance and capacity in such a manner that the negative resistance is alternately greater and less than the positive resistance, but that the average value of resistance is positive, then the circuit will not of itself produce oscillations. However, during those intervals when the negative resistance is greater than the positive the circuit will produce great amplification of the impressed emf. The free oscillations which are set up during the periods of negative resistance are directly proportional in amplitude to the amplitude of the impressed emf. The forced oscillations produced by the exciting emf. and the free oscillations caused by any normal variation in tube operation are both small.

Absence of spark interference is a feature of the new circuit which was demonstrated by Mr. Armstrong by receiving the broadcasting program of the Westinghouse station in Newark, N. J. The amplifying power of the circuit was demonstrated to be far superior to that of an ordinary two-stage amplifier set by receiving broadcasting through a loop antenna inside the steel structure of the Engineering Societies Building.

Northwest's Needs and Depreciation Reserve Topics at Boise

A WELL-ATTENDED meeting of the Northwest Electric Light and Power Association was held at Boise, Idaho, on Wednesday, Thursday and Friday of this week. The occasion was the fifteenth annual convention of the association, which is affiliated with the National Electric Light Association, and President-elect Frank W. Smith and Executive Manager Aylesworth of the national association were in attendance and made addresses.

In his opening remarks W. R. Putnam of the Idaho Power Company, president of the association, dwelt on the subject of taxation. The utilities in the Northwest, he said, are paying from 7 to 14 per cent of their gross earnings in taxes, whereas the average merchant pays only six-tenths of 1 per cent of his gross earnings for that purpose. Necessarily utility taxes will bear a higher proportion to gross earnings than do the taxes of merchants, but, in Mr. Putnam's estimation, the present difference is too great. Customers of utility companies, he said, must recognize that taxes on utility property are paid out of rates and that one of the means of decreasing the cost of utility service is to decrease the taxes levied against the public utilities.

An excellent address of nation-wide interest was delivered at Wednesday morning's session by George Erb, president of the Public Utilities Commission of the State of Idaho. In this address Commissioner Erb dwelt on the natural advantages possessed by Idaho and said that in order for the state to take the place in the production of the products of the soil to which she is entitled immense sums of outside capital must be attracted to it. "We need," he said, "and must have large reclamation and irrigation projects, additional miles of railroad, immense hydro-electric development and a greatly increased network of telephone and telegraph lines. Other cities and villages will come into existence requiring waterworks. In carrying out these developments it will be necessary to market not only municipal but utility securities, and should we in Idaho place such restrictions upon money invested in public utilities as would result in a very small return or none at all, beyond question the result would be that foreign capital seeking investment would pass us by and go to territory where more liberal treatment would be met with."

A liberal policy alone, he said, can guarantee to the present consumers a continuity of adequate and efficient service. In Mr. Erb's estimation, there is altogether too much antagonism by the users and prospective users of utility service toward the agency which affords them this service. To remedy this condition he suggested an open-door policy with reference to depreciation reserves. Commissioner Erb said that many utility companies and their managing officials looked upon this fund as becoming the property of the utility as soon as it was earned. The depreciation fund, he claimed, is, on the contrary, the property of the patrons until actually used for the purpose of replacing property destroyed, worn out or outgrown. Until so used it is a trust fund for which the utility management is to be held responsible. A proper realization of the character of the depreciation reserve on the part of the utility management would go far, in Commissioner Erb's estimation, toward allaying suspicion, distrust and antagonism.

Mayor Shank Recedes from Stand for the Abolition of Commission

A CONFERENCE between Major Shank of Indianapolis and Governor McCray of Indiana has, it is believed, put a stop to efforts on the part of the Mayor to abolish the Public Service Commission of the state. Two amendments to the commission law will, instead, be prepared for submission to the next Legislature, Major Shank said after the conference. One amendment will provide that when the commission sits on a case of importance to a community the hearing shall be held in that community. The other amendment will provide that the board of works, town board, county commissioners or other public representatives shall sit with the commission during its consideration of matters pertaining to any case in which the community is interested.

The amendments which Mayor Shank says he and the Governor have agreed upon are in line with suggestions for changes in the law made some time ago by the Corporation Counsel of Indianapolis. Mayor Shank said he thought the enactment of the proposed amendments would fill the pledge of the Republican state platform adopted recently, which pledged the party to abolish the law creating the commission or to amend it so as to make it more "responsive to the welfare of the people."

Electric Power Club Makes Progress at Annual Meeting

A REOPENING of the question of temperature ratings of motors and generators was one of the interesting and valuable features of the annual meeting of the Electric Power Club (which represents 98 per cent of the manufacturers of electrical power apparatus and control equipment), held this week at Hot Springs, Va. The discussion and action on this subject thus far, as every one knows, have resulted in the two standards of temperature rating—the double-rating 40-degree-55-degree standard and the single-rating 50-degree standard. At the Power Club meeting this week the Motor and Generator Section unanimously recommended that a committee be appointed to try once again to harmonize the views on this question and to attempt to work out an agreeable single standard of rating "such as 40 degrees without overload rating or any other single-standard basis." The club authorized the appointment of the committee.

Simplification Practice Recommended

Advance in transformer standard ratings was also noted at this meeting. The Transformer Section has definitely recommended, and the club has approved, the adoption of certain "preferred standards" as "recommended practice to take effect Jan. 1, 1923." There are now nearly 10,000 recognized standards, including all the various ratings as to capacity, voltage ratio, etc., and the object of this latest action is to select from the groups of single-phase distribution transformers and of single-phase power transformers certain sizes and ratings which, it is recommended, shall be the sizes to concentrate on. Eventually it is purposed to eliminate others from production.

Tables showing the ratings which have been selected by the section as "recommended practice" will be printed in next week's issue. The club recognizes this move as being in line with the "simplification" practices recommended by Secretary of Commerce Hoover. Standards of transformers for voltages heretofore not covered were also adopted. These standards cover voltages from 44,000 to 220,000 primary and 6,600, 11,000 and 13,200 secondary.

The Transformer Section announced that the apparatus committee of the National Electric Light Association joined heartily in making these recommendations.

There was also noted a tendency of the club to recognize a responsibility for standards of installation and operation, as well as of rating, test, etc. This move is occasioned by the feeling that the manufacturer's responsibility does not end with the mere delivery of the apparatus, but that the customer's best interests are served by being advised as to approved and efficient methods of installation and operation. No accomplishment is to be noted as yet, but the club has actually started a considerable amount of work along this line.

Electric Tool Section Makes Progress in Standardization

The Electric Tool Section reported some remarkably good progress in tool standardization. The committee has completed a set of standards of electric tool specifications which is the first constructive standardization work ever done in the electric tool industry. This report of standard sizes will be made public as soon as the required formality of approval has been taken care of.

There was also reported substantial progress by all other sections and committees of the club, and the harmonious manner in which the club is making progress in its work was generally commented upon during the meeting. One of the reports of interest was that of the cost-accounting committee, which will be treated at greater length in an early issue.

Nicholson Discusses Manufacturers' Council

In an intimate discussion of the functions and activities of the Electrical Manufacturers' Council, S. L. Nicholson, its chairman, dwelt on what the manufacturing branch of the industry is doing through the council to better all conditions in the industry. He pointed out that the relations of electrical manufacturers to all other bodies are on a better basis because all the parts of the electrical manufacturing branch of the industry have reached a common understanding in the council.

Mr. Nicholson also mentioned that the advisory board of the council had recommended and the council had adopted a policy of joint representation on committees of the industry rather than one of minority representation on committees appointed by other associations and organizations. Thus all questions before such joint bodies have to be approved by the Manufacturers' Council or by one of its three constituent bodies if it concerns only one of them, before they become effective as an agreed policy. Already a joint committee with the N. E. L. A. on power factor and starting currents of induction motors has been appointed and is at work, and a joint committee on standardization of service voltages is now being appointed.

Better Business Practices

In an address devoted largely to better business practices, President Russell encouraged the members of the club to push ahead in accord with the spirit of the times. He stressed two points principally. First, he recommended that the standards of the club be gone over carefully by each section to determine if there are any "commercial non-essentials" in the standards and ratings and, if so, to suggest possible ways for their gradual elimination. Electrical manufacturers, particularly those of power apparatus and control equipment, he said, must be more and more quantity manufacturers rather than operators of job shops—this in the interest of the buying public and buying industries. Second, Mr. Russell specially emphasized that there are many commercial practices of electrical manufacturing concerns which the majority of the business world does not consider sound. Therefore, in the interest of the electrical manufacturing business, and especially of the public served, each manufacturer should sit down and take stock of his individual commercial practices and eliminate those which the public might in general call economically unsound. One particular point he mentioned was that when a contract is made it really should mean something to both parties—it should call for delivery by the manufacturer and it should be more than an option for the purchaser—it is a purchase and sale agreement to be executed.

On recommendation of President Russell, the board of governors voted to move the headquarters of the club from St. Louis to Cleveland. It was brought out that

twenty-six members are in Ohio and that sixty-five are within an overnight trip from Cleveland and the others not more than eighteen hours away, making Cleveland a logical center. The actual transfer of the office will take place some time within the next two months.

The club adopted a resolution opening its membership to Canadian manufacturers on the same basis as manufacturers within the United States.

The meeting this week was well attended by more than eighty representatives from the seventy-eight member companies. The usual sports at Hot Springs were interspersed with the business sessions. The annual banquet was held Tuesday evening. The final session was not closed as these pages go to press and announcement of offices elected will be made later.

Pacific Coast Association Again Holds Successful Industrial Conference

FOLLOWING the experiment made last year at the annual convention of the Pacific Coast Electrical Association of bringing into the convention representatives of the business and industrial interests of the state to place before them the policies and problems of the industry, this year's convention, held last week in Los Angeles, organized a similar industrial conference Friday afternoon and evening. The whole convention was an unqualified success. The registration was large and the sessions were well attended. As was to be expected, most of the speakers devoted themselves principally to discussing and reiterating various phases of the proposed California water and power initiative act, but in addition to this important subject opportunity was taken further to acquaint those from outside electrical circles with the importance of the industry, and in this work the association struck a new stride.

A report of the opening session on Wednesday was printed in last week's issue of the ELECTRICAL WORLD. The technical session on Thursday morning was devoted principally to the discussion of meters, meter testing and special devices for facilitating meter testing. The latter subject is one of particular importance in California because of the forthcoming rules of the California Industrial Accident Commission, which will require all wiring for industrial establishments to be inclosed in metal, thus necessitating special facilities in order safely and easily to test meters. The report of the committee on this subject was rendered by W. R. Frampton of the Southern California Edison Company.

The other subjects discussed at this meeting were hydraulic power and underground systems. The committee report on the first of these topics, which was made by F. O. Dolson of the Southern Sierras Power Company, proved to be unusually interesting in that the committee had compiled physical statistics of all of the important hydro-electric installations in the West. The report of the underground-systems committee, which was given by R. R. Cowles, Pacific Gas & Electric Company, included a survey of progress during the past year, noting particular features of new installations and methods.

The final technical session was held on Friday morning, when reports on overhead systems and safety rules were presented and briefly discussed. The overhead-systems report was rendered by L. M. Klauber, of the San Diego Consolidated Gas & Electric Company, and the safety rules committee report was presented by W. F. Jordan, Southern California Edison Company.

The final meeting of the Commercial Section was held Thursday morning and was devoted entirely to the discussion of illumination. Two papers were presented, one by G. T. Bigelow of the Southern Sierras Power Company on "Why City Streets and Highways Should be Better Lighted," and one by W. L. Frost, Southern California Edison Company, on "Some Undiscovered Markets for Electricity in Illumination." Considerable discussion revolved around the intensity of illumination which should be recommended, particularly for residence interiors. Although it is appreciated by illuminating engineers that an intensity of from 2 ft.-candles to 5 ft.-candles would be desirable, yet the present accepted intensities are so much less that the ideal intensity was held to involve too great a step to attempt at one time. Furthermore, although it would be desirable to have the general public familiar with the terms generally used by illuminating engineers, it was thought by some that quicker and fairly satisfactory results would be obtained if lighting were sold in terms of watts per square foot of floor area. It was held that for the present it would be satisfactory to secure an intensity of 1 watt per square foot and that the use of this term would be readily understood by both contractors and owners.

CONFERENCE ON INDUSTRIAL NEEDS

On Friday afternoon the Pacific Coast industrial conference already alluded to was held and was presided over by W. E. Creed, president of the Pacific Gas & Electric Company. The following program was presented: "The Industrial West," by Robert Sibley, editor of the *Journal of Electricity and Western Industry;* "National Finance and Some Lessons of the Past," by H. F. Beebe of the Harris-Forbes Company and president Investment Bankers' Association of America, a forceful presentation of the fundamental relationship of national financing and utility financing, with particular reference to the importance of selling securities to customers and others in the territory served by the utility; "The Farmers' Interest in the Water and Power Bill," by J. A. Teagarden, regional director of the Farm Bureau of California, an indorsement of the service rendered by the utilities of California and a condemnation of the folly of turning from them to an experiment under state ownership, and an address by John B. Fredericks, president of the Los Angeles Chamber of Commerce, on "Government and Industry."

At the banquet Friday evening John B. Miller, president Southern California Edison Company, was toastmaster and introduced Charles F. Stern, vice-president First National Bank of Los Angeles, who spoke on the financing of the electrical industry in the future. Dr. E. C. Moore of the University of California, C. K. Field, editor *Sunset Magazine*, and C. H. Rowell of the California Railroad Commission also spoke.

During the final business session, which was held Friday morning, M. H. Aylesworth, executive manager National Electric Light Association, gave a vigorous address on the state of the industry and pointed out its opportunities for the future. J. B. Black, general sales manager of the Great Western Power Company of San Francisco, was elected president for the coming year; L. M. Klauber, general superintendent of the San Diego Consolidated Gas & Electric Company, first vice-president, and William Baurhyte, vice-president Los Angeles Gas & Electric Company, second vice-president.

Canadian Electrical Association Issues Program for June Meeting

MEETING at the Chateau Laurier, Ottawa, Ontario, on June 15, 16 and 17 for its thirty-second annual convention, the Canadian Electrical Association will follow this program, with additional special features:

THURSDAY, JUNE 15

Morning.—President's address; report of secretary and treasurer; report of membership committee, M. K. Pike; report of Public Relations Section, J. B. Woodyatt.

Afternoon.—Report of Commercial Section, L. W. Pratt; report on power sales, P. R. Labelle; report on merchandising, Reo L. Atchison; report on industrial lighting, J. H. O'Hara.

FRIDAY, JUNE 16

Morning.—Report of Technical Section, R. J. Beaumont; report of meter committee, E. Holder; report of electrical apparatus committee, J. S. H. Wurtele; report of underground systems committee, L. A. Kenyon; report of overhead systems committee, A. P. Doddridge; report of hydraulic power committee, R. M. Wilson; report of inductive-interference committee, J. T. Trimingham; report of lamp committee, Watson Kintner.

Afternoon.—Report of Accounting Section, Lieut.-Col. D. R. Street; report of accident prevention committee, Wills Maclachlan; address by Charles B. Scott, manager Bureau of Safety Chicago; report of rural-lines committee, P. T. Davies.

New Englanders Get Behind Electric Vehicle Movement

TWO HUNDRED central-station men, manufacturers' representatives and users of electric trucks gathered at the Boston City Club May 24 under the auspices of the Electric Vehicle Bureau of the New England Division of the National Electric Light Association to listen to addresses upon the latest developments in electric transportation and testify anew their interest in this development and faith in its prosperity. President C. L. Edgar of the New England Division occupied the chair and E. S. Mansfield of the Boston Edison company acted as toastmaster.

Iowa Section, N. E. L. A., Meets at Lake Okoboji on June 20

SUBJECTS ranging from studies of the use of electricity on farms to a report on inductive interference will be discussed at the annual convention of the Iowa Section, N. E. L. A., to be held at the Inn Hotel, Lake Okoboji, from June 20 to 23. The first day's session will be held jointly with the Iowa Electric Railway Association, but the N. E. L. A. section will hold separate sessions on Wednesday, Thursday and Friday mornings. The afternoons of these days will be devoted to recreation. The convention banquet is scheduled for Wednesday evening. The tentative program follows:

TUESDAY, JUNE 20

Afternoon.—"The Preparation of a Valuation for Rate-Making Purposes," by L. R. King; "Valuation of Public Utility Property," H. M. Engh; "Group Insurance for Employees," Peter F. Bouquet; "Customer Ownership of Public Utility Securities," H. E. Weeks; "Recent Court and Commission Decisions Affecting Public Utilities in Iowa," John A. Reed, William Chamberlain and George A. See; report of Iowa Committee on Public Utility Information, F. J. Hanlon and Joe Carmichael.

WEDNESDAY, JUNE 21

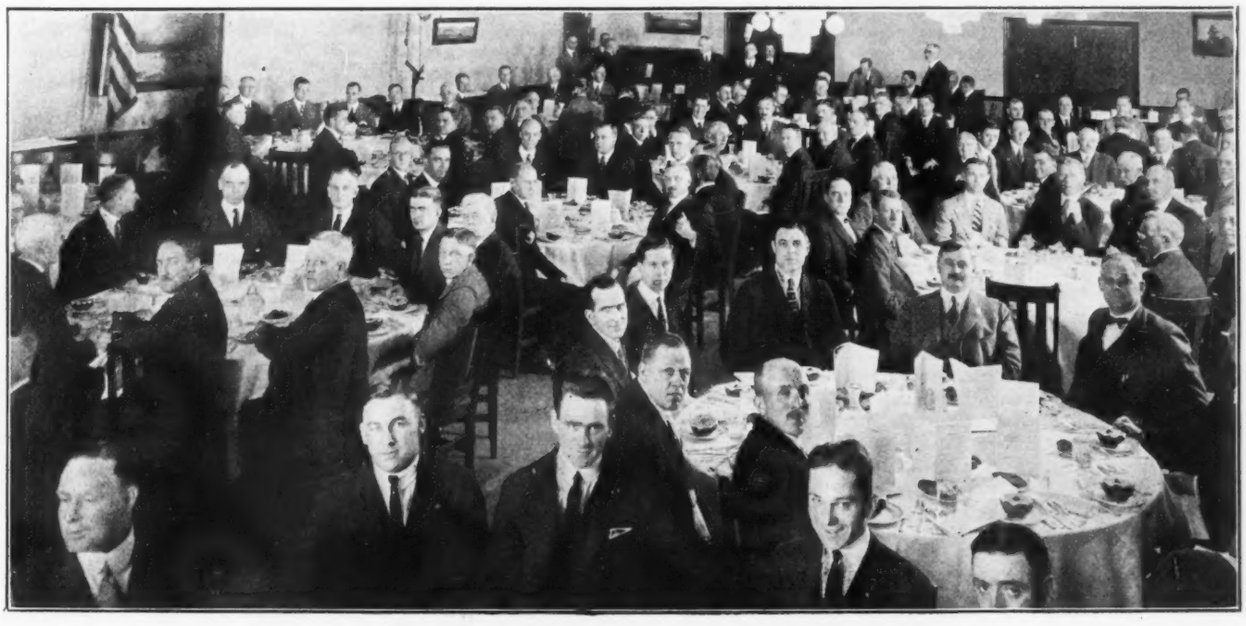
Morning.—Reports of sections and committees.

THURSDAY, JUNE 22

Morning.—Report on committee on electric service rates, O. W. Harrod; "Electric Service Rate," J. B. Hill; "Analysis of the Costs of Producing Electrical Energy," W. J. Greene; "The Essentials of Electric Cooking Rates and Service," N. T. Wilcox; "Reduction in Output Due to Low Voltage," A. H. Ford.

FRIDAY, JUNE 23

Morning.—"Lightning Protection of High-Tension Circuits," a representative of the General Electric Company; "Metering of High-Tension Current," a representative of the Westinghouse company; report of rural lines committee, F. H. Brooks and V. L. Hein; "Observations Regarding the Use of Electricity on the Farm," C. A. Baumgart; "Liability Insurance for Electric Transmission Lines," A. W. Jones; report of inductive-interference committee, Austin Burt, John M. Drabelle and A. B. Campbell; election of officers.



BANQUET OF NEW ENGLAND ELECTRIC VEHICLE ENTHUSIASTS

Telephones in South Africa.—South Africa is particularly proud of the rapid increase in its use of the telephone. In the last ten years, advices to the Department of Commerce say, the number of exchanges has increased 420 per cent, the number of subscribers 274 per cent, the mileage of telephone wire 177 per cent, and capital expenditures 333 per cent. Throughout the Union of South Africa there is now one telephone for every twenty-seven white persons.

Water-Power Conference in North Carolina.—A conference on water powers in the southern Appalachian region is to be held at Asheville, N. C., June 20 to 22. It is announced that Secretary of Commerce Hoover will address the conference on "Power and Progress." The Governors of Tennessee, South Carolina and Georgia, O. C. Merrill, executive secretary of the Federal Power Commission, and several prominent engineers and industrial company executives will speak.

Progress at Copco Power Plant.—Work preparatory to the installation of a second unit at the California-Oregon Power Company's Copco plant, begun last December, is progressing favorably. Practically all excavation work, including a penstock tunnel, has been completed, and the power-house foundation is in place. The generating equipment, an 18,000-hp. unit, is on the ground, having been there in storage for several years. It is expected that the work will be completed before next December.

War Department Seeks to Acquire Kentucky Transmission Line.—The Senate military affairs committee has reported a bill authorizing the acquisition by the War Department of necessary easements for the power-transmission line from Louisville to Camp Knox, Ky., which was originally built on leased land. The estimated cost of acquiring the right-of-way for the line is given by the department as $15,000. In case the right-of-way is not acquired, the cost to the government of removing the transmission line and its reconstruction, together with damages to owners, would be much more than the proposed appropriation.

Power Development in Northern Ontario.—The potential energy of the Abitibi River and its tributaries in the far north of the Province of Ontario has in large part been allotted by the authorities. A large development, the *Canadian Engineer* understands, is to be made by the Temiskaming & Northern Ontario Railway, which contemplates electrifying a portion of its lines near Cochrane, and further reservations of 30,000 hp. between New Post, the railway's first objective in its step toward James Bay, and its final terminal at the tidewaters of the Atlantic are contemplated. Another company has applied for 40,000 hp. at Three Carrying Places Rapids. It has been virtually decided to reserve the Long Sault Rapids, where 60,000 hp. can be produced, for future disposition.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Municipal Plant Project Abandoned.—The city commissioners of Enid, Okla., have abandoned their plans for a municipal light and power plant and have reached an arrangement with the Oklahoma Gas & Electric Company whereby the city will secure reductions in lighting and power rates approximating nearly $5,000 yearly.

Regulating Radio.—The Philadelphia Fire Underwriters' Association has issued in pamphlet form its tentative regulations for radio signaling apparatus. These regulations are intended to reduce the life and fire hazard of radio apparatus and are issued to secure field experience in advance of their consideration as a revision of the rules on radio signaling apparatus contained in the National Electrical Code.

Finland's Largest Water - Power Plant.—An electric power plant erected in the middle of a waterfall has just been completed at Voikka, Finland. The plant, according to information just received by the Department of Commerce, is the largest in Finland. The site for the power house was blasted out of the rock, and the turbine room will be 25 ft. below the brink of the fall. The new plant supplements two existing power houses using water from the same fall. It contains three 4,500-hp. turbines.

Seven Years' Growth of the Pacific Gas & Electric Company.—The sixteenth annual report of the Pacific Gas & Electric Company shows a gain for 1921 over 1920 of $2,464,000 in gross operating revenue, of $1,636,070 in net earnings, of 29,600 in the number of consumers and of 4,200 in the number of stockholders. Sales of electricity fell off by 20,400,000 kw.-hr. compared with the high-water mark of 1920, but reached 1,021,821,000 kw.-hr., an increase of 126 per cent since 1914. In this seven-year period gross operating revenue increased 118 per cent, number of consumers 58 per cent and number of stockholders 528 per cent.

Memorial Day Exercises Carried by "Loud-Speaker System" to Vast Throng.—The speeches and music at the Memorial Day exercises held in Washington, D. C., when President Harding dedicated the new Lincoln Memorial, were heard over an area perhaps larger than any ever reached by human voice before. For more than a month more than one hundred experts of the Bell System were at work installing a "loud-speaker system" which carried the words and music for half a mile to every corner of the vast open space in front and on the sides of the building. If it had been possible to gather a million people at the exercises, they could, it is said, have heard every word distinctly. The amplifying apparatus donated by the American Telephone & Telegraph Company was hidden in the recesses of the Memorial and all that the throng attending saw was a tiny box on the platform, the transmitter and some inconspicuous white wooden horns along the top of the structure.

A New Use for Wireless.—Fire alarms by radio may be an outcome of the rapid growth in the use of wireless transmission in New York City, according to a reporter of firemen's doings. The men in many of the firehouses have received permission from the department to install receiving sets at their own expense, and though up to the present these have been used for amusement only, the firemen are ready to respond to any call to duty which may reach them in this way.

Fixation and Utilization of Nitrogen.—The final report of the nitrate division of the Ordnance Office of the War Department, assisted by the fixed-nitrogen research laboratory of the Department of Agriculture, has just been issued. It contains, besides a comprehensive introductory chapter, chapters on the utilization and sources of inorganic nitrogen, the development of nitrogen fixation in the United States and foreign countries, nitrogen fixation processes, nitrogen conversion processes, the results and possibilities of research, and the activities of the United States in the development of fixed nitrogen, with appendices describing the United States nitrate plants.

Associations and Societies

Empire State Gas and Electric Association.—The annual convention of this association will be held at the Lake Placid Club, Lake Placid, N. Y., on Thursday and Friday, Oct. 5 and 6.

Coming Meetings of Electrical and Other Technical Societies

N. E. L. A. Geographic Divisions—North Central, St. Paul, June 13-15; Iowa Section, Lake Okoboji, June 20-22; New England, New London, Conn., Sept. 5-7.

Canadian Electrical Association—Ottawa, Ont., June 15-17.

Associated Manufacturers of Electrical Supplies—Spring Lake Beach, N. J., June 19-25. (For program see issue of June 3, page 1139.)

Society for the Promotion of Engineering Education—Urbana, Ill., June 20-23.

American Society of Civil Engineers—Portsmouth, N. H., June 21-22.

American Association for the Advancement of Science—Salt Lake City, June 22-24.

American Physical Society, Pacific Coast Section—Salt Lake City, June 22-24.

Association of Municipal Electrical Utilities of Ontario—Niagara Falls, Ont., June 22-24.

A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30. (For program see issue of May 13, page 968.)

American Society for Testing Materials—Atlantic City, N. J., June 26-July 1.

National Council Lighting Fixture Manufacturers—Cleveland, June 28-29.

Ohio Electric Light Association—Cedar Point, Ohio, July 11-14. (For program see issue of May 13, page 972.)

A. I. E. E., Pacific Coast Convention—Vancouver, B. C.—Aug. 8-11.

International Association of Municipal Electricians — New Bedford, Mass. Aug. 22-25.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Enforcement of Contract with Municipality Cannot Be Interrupted by Claim that It Will Bankrupt Utility.—The Arkansas Corporation Commission at first granted and afterward rescinded an order permitting the Central Light & Power Company to advance its rates in the town of Pocahontas. In a suit of the company against the town to enjoin the enforcement of the old rates, the circuit court found that the company had never surrendered its franchise rights to the commission, and that the rates were confiscatory. The circuit court fixed new rates, and the town carried the fight to the Supreme Court of Arkansas, which has reversed the finding, declaring that an act of the municipal corporation passed after the abolition of the Corporation Commission and putting in force the franchise rates was not reviewable by the courts, and that the enforcement of the contract could not be interrupted on the ground that it would result in the bankruptcy of the central-station company. (239 S. W. 1.)*

Obligation to Serve Competitor.—In its finding in North Carolina Public Service Company vs. Southern Power Company, in which the latter company was forbidden to discontinue service to the former at Greensboro and High Point, N. C. (see issue of May 27, page 1088), the United States Circuit Court at Richmond, Va., thus deals with the issue of compulsory service to a competitor, which was raised by defendant company: "Defendant's claim stated in its nakedness is based on the assertion of fact that the North Carolina Public Service Company and other independent vendors are competitors in business of the Southern Power Company, and on the legal contention that as such competitors they are not entitled to claim service as parts of the public—that in respect to independent vendors of current the North Carolina Corporation Commission has no power to regulate rates. If the Southern Power Company and the North Carolina Public Service Company are competitors at all, they are so in a restricted sense. . . . There is high authority for the general proposition of law that one competitor in business cannot demand service of another in promotion of its business. But when a corporation has definitely undertaken and entered upon a particular service authorized by a charter, which confers the right of eminent domain, the obligation to perform the service is complete, its rates and terms are subject to regulation by public authority, and it must serve all alike. In such public service it cannot pick and choose its customers. In this instance the Southern Power Company has definitely undertaken, entered upon and continued the service of transmitting electrical energy to independent vendors thereof under the authority of its charter, and for that purpose has exercised the power of eminent domain conferred by the state. It cannot now be heard to say that it owes no public duty with respect to that service, and that it may pick and choose its customers, and arbitrarily discriminate among them."

Permissible Instructions in Damage Suits.—In affirming a verdict for damages because of the death of a telephone lineman from contact with power transmission wires while making repairs (Cawley vs. People's Gas & Electric Company), the Supreme Court of Iowa found the following instructions given by the lower court to the jury, and to which exception had been taken, to be unobjectionable: That the defendant was obliged to have consideration of the rights, safety and comfort of any one who might be in the vicinity of its line; that the defendant was obliged to exercise care in the use of an agency "which is a source of peril to others rightfully within its vicinity"; that if the jury found that the defendant maintained its high-voltage wires without sufficient clearance over the telephone wires and knew of such condition and the victim was killed without contributory negligence, the jury should find for the plaintiff (this instruction neither placing on the defendant the duty of furnishing a safe place to work to one not in its employ nor imposing upon it a duty to inspect not raised in the pleadings); that the decedent was required to exercise "such care and caution as a man in his calling would exercise under like circumstances"; that the jury should determine whether the decedent reasonably supposed that he could safely work upon the pole in question; that "expert testimony is most useful in cases of conflict between witnesses as corroborating testimony," and that "the value of such testimony depends upon the circumstances of each case, and of these circumstances the jury must be the judge"; that when expert witnesses testify to matters of fact from personal knowledge, then their testimony should be considered as that of other witnesses, and that "alleged verbal statements or admissions should be received with great caution." Nor was it an error to receive rebuttal testimony of a witness who made observations of applicant's lines during the trial. The Supreme Court, however, held that the amount of damages, $15,000, was excessive and required a reduction by the amount of the award made under the workmen's compensation act—$3,441. (187 N. W. 591.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

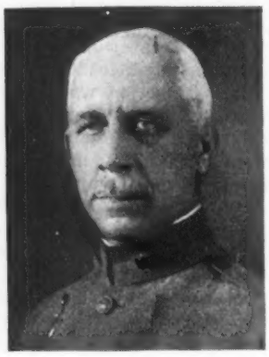
Commissioner May Publicly Criticise Company without Forfeiting Right to Sit at Hearing.—The right of a member of a public service commission to comment adversely in public on the practice of utility corporations in applying for higher rates and then to sit at the hearing to determine the need for such rate, has been upheld by the Public Utilities Commission of Louisiana. Objection was made to the presence of a commissioner at a hearing for increased telephone rates on the ground that he had commented severely on the demands for higher rates by public utility corporations when they at the same time are demanding a reduction of wages. The commission overruled the challenge. After pointing out that the duties of a public service official, according to the Louisiana constitution, are legislative, not judicial, it quoted from the Supreme Court record showing that in such a case a petitioner can make no contest, especially where there is no allegation that the commissioner is interested in the outcome other than as a public official.

Reduction in Rural Rates.—A reduction in the agricultural rates of the Southern Sierras Power Company has been ordered by the California Railroad Commission. The reduction for the average operation, it is estimated, will amount to as much as 20 per cent, while the general average reduction for agricultural service on the entire system is computed to be approximately 5 per cent. The new rates will benefit all agricultural consumers receiving service at 2,200 volts or over and also those receiving service at 220 volts or 440 volts whose consumption exceeds 500 kw.-hr. a year. There will be no change in rates for those using less than the latter amount. In addition to the reduction ordered the form of rate has been changed to the advantage of consumers. The company is directed to replace the present demand and energy rate with an energy form of rate with a minimum charge in which both the energy charges and the minimum charges are based upon the annual consumption. The new schedule also contains an optional demand and energy rate in which both the demand and energy charges are based on annual consumption, besides a provision to the effect that if any consumer at the end of the year finds that any of the optional schedules would have been more advantageous to him the company will be required to adjust his bills to this lower schedule.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Gen. George H. Harries, vice-president of H. M. Byllesby & Company, has been decorated with the distinguished service medal of the navy. The presentation was made April 12 by Secretary Denby at the Navy Department in Washington. General Harries had previously received a distinguished service medal from the army, this double decoration having been won by only eight other officers in either service. General Harries is now on the list of reserve officers after many years in the active military service of the nation. During the world war he was in charge of the Fifty-ninth Depot Brigade of the Thirty-fourth Division. He then commanded the One Hundred and Eighty-sixth Infantry Brigade and took this organization overseas. He was commander of Base Section No. 5 at Brest and directed all the construction work at that port. Following the signing of the armistice, he was placed in command of the Eighty-seventh Division and was relieved of that charge to become chief of the United States military mission, in which capacity he was the first American officer to enter Berlin after the war.



G. H. HARRIES

J. E. Harsh, recently elected president of the Nebraska Section, N. E. L. A., is the vice-president and general manager of the Lincoln Gas & Electric Light Company. Mr. Harsh first entered the utility field in 1903 as meter reader with the Denver Gas & Electric Company. After a year he entered the new-business department and in 1908 was sent to the Empire District Electric Company at Joplin, Mo., as new-business manager. He remained there until 1912, when he was transferred to the City Light & Traction Company at Sedalia, Mo., to organize a new-business department, this property having been taken over by the Doherty interests. The next year saw Mr. Harsh as manager of the Salina (Kan.) Light, Power & Gas Company. His election to the vice-presidency of the Lincoln Gas & Electric Company dates since 1917.

S. B. Williams, who for the past two and a half years has been assistant managing editor of the ELECTRICAL WORLD, resigned on June 8 to become managing editor of the *Electrical Record*, published by the Gage Publishing Company, New York. Mr. Williams has been with the ELECTRICAL WORLD since his graduation from Princeton as an electrical engineer in 1914. He is responsible for the development of several of the ELECTRICAL WORLD'S service features, such as the trade and markets section, the legal section and the present news section. During his eight years with the WORLD he has held the positions of editorial representative, statistical editor, commercial editor, news editor and assistant managing editor. In this last capacity he continued also to act as news editor. For the past three years he has been the editor of the popular National Electric Light Association convention daily. Mr. Williams is the author of "Cutting Central Station Costs," published by the McGraw-Hill Book Company; "Electrical Development 1910-1920," new edition Encyclopædia Britannica, and "Effect of War on Electrical Apparatus in the United States," prepared for the International Labor Office of the League of Nations.

L. W. W. Morrow, who has been assistant professor of electrical engineering at Yale University for the past four years, has been appointed associate editor of the ELECTRICAL WORLD. Professor Morrow is a graduate of Cornell University in electrical engineering. After teaching at that institution for two years he went to the University of Oklahoma, where he became director of the school of electrical engineering in 1916. While a resident of Oklahoma Professor Morrow was secretary of what is now the Public Utilities Association of Oklahoma and was also associated with various Oklahoma utilities in a consulting capacity. Since he has been at Yale University Professor Morrow has acted as consulting electrical engineer for several companies in the East. He served as special editorial representative on the staff of the *Electric Railway Journal* during part of 1920 and 1921 and has made editorial contributions from time to time to the ELECTRICAL WORLD, *Power*, the *Electric Railway Journal* and *Bus Transportation*. He is the author of a storage-battery manual published by the War Department.

J. H. Brown, sales manager of the Lafayette district of the United Gas Improvement Company, Philadelphia, has been appointed sales manager of the Counties Gas & Electric Company of Ardmore, Pa.

Arthur G. Gibbony has entered the engineering department of the Ohio Power Company as superintendent of substations in the southern division. Mr. Gibbony was for several years with Stone & Webster in the Middle West, prior to which he was connected with the Aluminum Company of America.

Prof. Charles L. Norton has been appointed head of the department of physics at the Massachusetts Institute of Technology, Cambridge, effective next fall and in succession to Prof. Edwin B. Wilson, who has resigned to take the chair of vital statistics at the Harvard School of Public Health. Professor Norton has been connected with the institute staff since his graduation in 1893 and for some years has been professor of industrial physics. During the past two years he was director of the division of co-operation and research, which conducts the so-called "Technology plan" of research for industrial and business enterprises that turn to the institute laboratories for assistance. Professor Norton has a wide reputation in the fields of heat insulation and fire prevention and was among the first to advocate the use of X-rays in medical diagnosis. During the world war he was an adviser to the Naval Consulting Board and inventions committee of the War Department and United States Signal Corps, besides devising a process and constructing a plant for the production of metallic magnesium, previously obtained almost

C. L. NORTON

exclusively from Germany. He will continue as director of the division of co-operation and research.

H. M. Cunnington, who has been in the business news department of the McGraw-Hill Publishing Company, has been made trade and market editor of the ELECTRICAL WORLD, succeeding H. H. Stinson.

H. H. Stinson, who has been editor of the trade and markets section of the ELECTRICAL WORLD since last fall, resigned on June 1 to become associated with the Brunswick Company of New York in publicity work and to engage in free-lance literary work. Mr. Stinson was the first ELECTRICAL WORLD editorial representative in St. Louis. He started the St. Louis market letter in the fall of 1920, and later went to Chicago, where he was assistant Western editor of the paper.

B. A. Plimpton has been appointed sales manager of the Locke Insulator Corporation of Victor, N. Y. This is in correction of a personal which appeared in the May 27 issue in which the address of the Locke Insulator Corporation was given as Le Roy, N. Y.

Lon Jourdet has been appointed Western manager for the Torrington Company, Torrington, Conn.

Obituary

Emerson McMillin, head of the banking house of Emerson McMillin & Company, New York, chairman of the board of the American Light & Traction Company and president of a dozen other lighting and traction concerns throughout the country, died on May 31 at his country estate, "Darlington," near Mahwah, N. J., after a few days' illness, of pneumonia. Being what is known as a self-made man, Mr. McMillin had a varied experience, perhaps only possible in this country of unlimited opportunities for the man able to grasp them, and his successful career could serve as an inspiration to any seeking to win Fortune's favors by their own personal efforts. Mr. McMillin received the education of a country school from the time he was six years old until he was ten, when he began to work about the steel furnaces. At the age of seventeen he enlisted in the Union Army and was commissioned second lieutenant for gallantry in service, having been wounded five times. After the war he went into merchandising and later into iron and steel manufacturing on an extensive scale. In 1883 he became interested in the gas business, gaining control of small works throughout the West. In 1889 the amalgamation of the four warring companies of St. Louis into the Laclede Gas Light Company demonstrated to capitalists Mr. McMillin's skill as an organizer. In 1891 he went to New York and established the banking firm of Emerson McMillin & Company. In 1901 the American Light & Traction Company was organized with Mr. McMillin as its president. He was an indefatigable worker, and after several years of unceasing attention to the business of this new company he was compelled to take a period of rest in Italy. To make his absence possible the office of chairman of the board of directors of the American Light & Traction Company was created, and Mr. McMillin held this office till the time of his death. He was also president and director of the Southern Light & Traction Company, the San Antonio Gas & Electric Company, the San Antonio Traction Company and several gas companies and vice-president and director of the Muskegon Traction & Lighting Company. He belonged to numerous economic and social clubs.

EMERSON MC MILLIN

Frank W. Edwards, sales engineer Dayton Engineering Laboratories Company, manufacturer of lighting and starting equipment, Dayton, Ohio, died recently at his home in that city, at the age of forty-one.

S. P. Coale, aged forty-five, professor of theoretical electricity at the Bliss Electrical School, North Takoma Park, D. C., was killed while on his way home on May 30 by being struck by an automobile. He had been connected with the school since 1902.

Frank E. Dunbar, vice-president of the Lowell Gas & Electric Company, died at his home in Lowell, Mass., on May 18. Mr. Dunbar was a native of Pittsfield, Mass., and a graduate of Amherst College. When a young man he located in Lowell and took up the practice of law. He was president of the Boott Mills and the Appleton Mills, both of which are textile plants. Mr. Dunbar was prominent in politics and at one time was a candidate for the Republican nomination for Congress.

Arthur B. Stitzer, vice-president and chief engineer of the Republic Engineers, Inc., New York, died from hemorrhage of the stomach on May 26, while on a business trip. Mr. Stitzer had for many years taken an active part in the work of the National Electric Light Association and in the American Electric Railway Engineering Association. He was chairman of the power generation committee of the latter association during 1921 and was its third vice-president in 1922. Mr. Stitzer was born on July 20, 1877, and

A. B. STITZER

was graduated from the University of Pennsylvania in 1899. Ten years later he received the degree of electrical engineer from that university. Upon graduation he became connected with the Union Traction Company of Philadelphia and later with its successor, the Philadelphia Rapid Transit Company, with which he remained until April 25, 1910. He then resigned to become electrical engineer for Ford, Bacon & Davis, with whom he remained until 1917, when he was appointed chief engineer of the Republic Engineers. On Feb. 10, 1919, he was elected a director of that company.

Louis F. Strothman, vice-president and general manager Richardson-Phenix Company, Milwaukee, division of the S. F. Bowser Company, Fort Wayne Ind., died three weeks ago after an illness of five months.

E. Parley Cliff, superintendent of the Heber City Light & Power Company, died on May 18 of pernicious anemia. Mr. Cliff was born at Mount Pleasant, Utah, and had been prominent in civic affairs for many years.

William B. Vansize, a patent attorney, who made a specialty of legal work for telephone, telegraph and electrical companies, died on June 1 at his home in Brooklyn, N. Y. At different times he was connected with the General Electric Company, the Commercial Cable Company, the American Marconi Company, the Radio Corporation and other concerns. Mr. Vansize was a member of the board of directors of the A. I. E. E.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

New England Collections Gradually Improving

RESPONDING to the improvement in general business and to easier money, collections in New England are decidedly better than was the case three or four months ago. Cash discounts are being taken by many large customers in purchasing from jobbers, and central-station payments as usual are on a highly satisfactory basis. No particular trouble is being experienced at present from New England manufacturers, barring some slight tendency toward slower settlements in communities hard hit by labor difficulties. In general, jobbers are cleaning up accounts on a sixty-day basis or less. Strict attention is being paid to taking on new accounts, and credit relations with contractor-dealers are being carefully followed.

Cost of Living About Stationary, Labor Statistics Bureau Shows

THAT the cost of living is about stationary is shown by monthly figures of the Bureau of Labor Statistics, which says that the prices of all commodities during April were 52 per cent above the average of 1913, compared with 52 per cent in March, 51 per cent in February, 48 per cent in January and 49 per cent in both December and November. Three of the nine individual groups show a rise in the table compared with March. Five items recorded slight recessions. While metals are only 17 per cent above the 1913 level, the average of all the others is more than four times above the 1913 level.

Conduit Prices Stiffen as Increased Demand Brightens Market

SLIGHTLY heavier demand for conduit brought on by greatly increased building construction has caused the tone of that market to become more firm. Pipe is moving more slowly than a week ago, manufacturers have noted, and there is a rather wide range in quotations. Prices on rigid conduit showed the following range this week: For ½-in. black pipe in 2,500-ft. lots, $44.50 to $46.58; ¾-in., $58.10 to $59.57, and 1 in., $82.79 to $84.66 per 1,000 ft. Quotations on galvanized pipe in the same sizes and quantities were $50 to $51.68, $64.50 to $66.47 and $92.20 to $94.88 per 1,000 ft. Owing to a serious labor condition in the Connellsville coke district, skelp is becoming less plentiful for pipe manufacturers, and it is thought if some agreement is not forthcoming in a few weeks there will be a serious shortage in the rigid-conduit market.

Predictions are to the effect that the market in conduit and flexible armored cable will soon be so active that prices will be much higher than the present levels.

Business Failures Numbered 407 Last Week

RETURNS of failures this week show 407 defaults in the United States as compared with 451 last week, and reveal a considerable increase over the 264 insolvencies reported to R. G. Dun & Company for the corresponding week of 1921. Of the current week's failures, 244 involved liabilities of $5,000 or more in each instance, which represents 60 per cent of the aggregate number. Last week, when there were 280 defaults, for $5,000 or more in each case, the ratio was 62.1 per cent, while the ratio a year ago, with 141 similar insolvencies, was 53.4 per cent.

Lighting Articles Duty Causes Protest by Importers' Association

THE American Importers' Association of Lighting Specialties has filed a brief with the Senate finance committee concerning the proposed rate of duty on illuminating articles of every description, including chimneys, globes, shades and prisms. In this brief it is pointed out that the total imports of illuminating glassware, as compared with the production of these articles in the United States, are not more than 5 to 10 per cent of the total consumption, and that the amount of illuminating glassware exported from the United States equals, if it does not exceed, the importation of similar foreign-made merchandise into the United States. It is emphasized in the brief that the domestic manufacturer enjoys advantages over the importer, such as being in a position to extend refunds in case of breakage, prompt shipments and a much larger volume of business compared with the sale of imported goods.

Request is made, therefore, that the proposed rate of 70 per cent ad valorem be changed to 45 per cent ad valorem, which is the rate now in force.

Metal Market Situation

COPPER prices remain unchanged, with demand continuing strong here and abroad. A rise above 14 cents will be slow, it is believed, as producers prefer to see consumption increase rather than to get higher prices.

Domestic demand is widespread, being fair from wiredrawers, brass founders and rollers. Inquiry is mainly for July, with some buyers still in the market for June. August demand, however, is larger than June inquiry at present. Agencies in a position to make large sales of July copper are not much more numerous than those with stocks of June metal on hand.

Demand for steel products continues heavy, particularly for sheets, and prices are comparatively firm. Orders on hand are reported to be large, and a good volume is expected indefinitely.

NEW YORK METAL MARKET PRICES

	May 29, 1922	June 7, 1922
Copper:		
London, standard spot	£ s. d. 62 2 6	£ s. d. 63 2 6
	Cents per Pound	Cents per Pound
Prime Lake	13.87@14.00	14.00
Electrolytic	13.75	13.87½
Casting	13.37½	13.37½
Lead, Am. S. & R. price	5.65	5.65
Antimony	5.37½–5.50	5.25
Nickel, ingot	36.00	36.00
Zinc, spot	5.62½	5.70
Tin, straits	30.75	32.62½
Aluminum, 98 to 99 per cent	17.87½	19.10
OLD METALS		
Heavy copper and wire	11.50 –11.75	11.50 –11.75
Brass, heavy	5.50 – 6.00	5.50 – 6.00
Brass, light	4.87½– 5.25	5.00 – 5.25
Lead, heavy	4.70 – 4.80	4.70 – 4.75
Zinc, old scrap	2.87½– 3.00	2.87½– 3.00

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

INCREASED demand throughout the country for wire and motors is the feature of this week's electrical market. Industrial requirements show the most activity in a market which for the last three weeks has been termed dull and unresponsive to the opportunities which are afforded by the great amount of residential and commercial building construction.

Jobbers express the belief that the new amount of business is only beginning to reach them, and that with many buildings now approaching completion they soon will have more orders than their none-too-full stocks will allow them to handle.

Conduit has shown much activity during the past week. The South and West report stocks in good condition, while the Eastern and Middle Western districts fear that increasing orders will soon take their reserves unless shipments from the manufacturer can move more quickly.

Central-station outputs are larger than a year ago, and more line construction is under way. Radio enthusiasts are buying less in the wire and instrument market because of static conditions, dealers say. It is said that the radio market will not show any great activity again until well into the fall months.

Daylight saving has not cut into retail lamp sales as much as had been expected. Prices are firm and much replacement buying is noted.

NEW YORK

The long-looked-for renewal of activity along industrial lines in the electrical trade is beginning to materialize. There have been many indications that this class of business was showing signs of life, but until the last two weeks actual increases in business from industrial plants were very slight.

Local jobbers who specialize on this class of customers appear to be very busy and express their satisfaction with this turn for the better. New industrial building and additions to existing industrial plants so far this year show an increase of about 100 per cent over the same period a year ago, and there is more confidence in the whole industrial situation than at any time since the latter part of 1920.

The demand for wiring material remains steady at about the same level as last week. No price changes were reported, and jobbers' stocks generally are in good condition.

There has been a marked falling off in the demand for radio equipment. This is due partly, of course, to the static conditions prevailing during the summer months. However, a great number of retailers have entered this business, and the supply of material is much nearer the demand than at any time since the first of the year. Jobbers expect that by fall the radio business will be on a much more stable foundation.

Rigid Conduit.—Demand is confined mostly to small lots, as the large users have protected their requirements by placing orders for future delivery under the previous schedule. Prices show quite a wide variation, although there is more of a tendency to hold out for the higher quotations.

Rubber-Covered Wire.—While there is only a moderate demand for wire, indicatons point to higher levels in the near future. Quotations are stiffening, and there is little inclination to cut prices to secure business. No. 14, rubber-covered, single-braid, shows a range of from $6 to $6.50 per 1,000 ft. in 5,000-ft. lots.

Flexible Armored Conductor.—No change in prices or demand for this material was noted this week. No. 14, two-wire, single-strip, sells for $42.50 and $43 per 1,000 ft., and double-strip for $45 to $47 per 1,000 ft. in that quantity.

Outlet Boxes.—Black boxes in standard-package lots are quoted at 60 to 62 per cent off list, and galvanized boxes in the same quantity at 55 to 57 per cent off list. Demand is fair and stocks are good.

Dry Cells.—No. 6 regulars in barrel lots of 125 are quoted at $29 per 100, and igniters in the same quantity at $30 per 100.

Fans.—Sales have been exceptionally good so far this season, jobbers reporting increases of from 20 to 25 per cent over last year. The 16-in. oscillator is in greatest demand, and dealers are reporting satisfactory business.

Washers.—Little improvement has been noted in the demand for washing machines, although prices are much lower than last year.

CHICAGO

Business in the electrical trade during the past week moved along on the even plane it had established the week previous. The strengthened copper market reflected a slight advance in rubber-covered wire. Building activity is still calling for a good volume of conduit and wire. Armored conductor is a close second. The motor industry for May on the whole showed activity practically equal to April's business, although a few variations were found. The transformer field was a bit slow.

Conduit.—Pipe is selling satisfactorily, but quotations vary, since price competition is still existing. While the ½-in. black pipe is quoted at $43 per 1,000 ft. in 5,000-ft. lots, better prices are sometimes offered in order to obtain orders. There are some jobbers, however, who attempt to maintain these figures since they prefer to lose orders rather than accept them and lose money on the deal. Stocks are in good condition.

Flexible Armored Conductor.—The demand for this conductor is continuing steadily, and quotations have not changed. The No. 14 two-wire, single-strip sells between $42.50 to $43 per 100 ft. in 5,000-ft. lots.

Wire.—Building construction is creating an active market for rubber-covered wire. A stiffened price following the rise in copper was noted on the No. 14 rubber-covered during the week, since it now sells for $6.10 per 1,000 ft. in 5,000-ft. lots. Stocks are good. The bare and weatherproof wire market has not changed noticeably although the demand has been steady.

High-Tension Equipment.—Another week of active business was reported by manufacturers of this equipment. One company mentions a sale of several 25,000-volt air-disconnecting switches to a Western utility. Another firm has listed orders for a 2,400-kva., 13,200-volt outdoor substation for steel mills and for four 600-kva., 22,000-volt outdoor substations for the Southwest. Farm-lighting equipment is also moving well.

Motors.—The motor market for the past month has been spotty. Though the weekly averages have not fallen below April's figures one company reports that most of the sales have been on medium-sized installations. Another firm states that it has received a fair volume of orders on medium sizes, and still another explains that its May sales were not as good as April's. Most of the sales have been for maintenance work.

Transformers.—While distribution transformers are leading in this field, some of the companies report little change during the month. Other firms say that the market has been a trifle slow.

Insulators.—Active trading on both suspension and pin-type insulators has been reported by manufacturers. One manufacturer who recently increased his working schedule from a three-day week to a five-day week is now working six days. Prices are firm.

BOSTON

Business conditions are brightening in New England, although no striking change occurs from week to week at present. Central-station outputs are substantially larger than a year ago, and more line construction is under way than for some time. The demand on wholesalers for radio-telephone equipment has slumped decidedly within a fortnight, and deliveries are now much improved on virtually all supplies except tubes. House wiring is progressing finely and wiring materials are moving actively. Building and engineering contracts for the week ended May 29 in New England totaled $4,690,100 against $4,998,000 for the corresponding week last year. In only four weeks of the past twenty years corresponding to these seven days has this total been exceeded. An important step was taken Monday by a number of large cotton textile mills in New Hampshire, when these were opened on the basis of the fifty-four-hour week and 20 per cent wage reduction specified by the manufacturers at the outbreak of the strike last winter. In Rhode Island striking employees have been gradually returning to work for some weeks, and it is reported that a third of the mills in that state are now operating on full time. Conditions are good in the paper-making industry; leather factories, while dull for the time being, are optimistic, and the metal-working plants are doing better.

Wire.—Competition is extremely sharp in rubber-covered and weatherproof wire. The former is moving at $6.25 per 1,000 ft. in 1,000-ft. lots, ample stocks being in hand. Weatherproof wire has stiffened about ½ cent per pound, the base Monday being about 16 cents. Central-station buying has improved noticeably. Bare-copper-wire sales are dull, and the demand for radio aerials appears to have fallen off somewhat.

Lamps.—Replacement orders are coming in well, and sales of lamps for summer cottage and resort hotel service are beginning to be more active. Daylight saving has not cut into retail lamp sales, owing probably to vigorous merchandising of modern illumination during the past few months.

Motors.—Sales by jobbers are very dull, although occasional moderate-sized orders for one or at most a few units are put through after careful shopping about by purchasers. Prices are firm.

Loom.—Within a fortnight sales have picked up encouragingly. Stocks are far ahead of the demand, however, and prices are steady and subject to much complaint as to low profits.

Flexible Armored Conductor.—Brisk sales are reported in some quarters, with stocks easily meeting requirements. New building operations are absorbing much of this material. No. 14 double-strip was quoted at $47 per 1,000 ft. in Boston Monday.

Pole-Line Material.—Cross-arms and hardware are moving better, though orders are still of moderate size. Six-pin 5½-ft., long-leaf, yellow-pine arms sell at $1 each in lots of less than 100, usual orders not exceeding fifty or sixty arms. Eucalyptus pins sell according to quality at $4 to $5 per 100. Hardware is moving correspondingly well.

Radio Apparatus.—Some producers note a recession in demand, and jobbers also are not receiving the avalanche of orders formerly in the mails. Static troubles during warm weather no doubt affect the market somewhat. It is apparent that high-quality sales effort will be required in maintaining the ultimate normal demand.

ATLANTA

Weather conditions are not only materially interfering with agricultural and building activities, but unless the rains cease in the next day or so considerable damage will result to cotton, peach and melon crops in the northern part of Georgia. Precipitation in the month of May is in excess of any month recorded by the Weather Bureau since 1879, with the result that a week or more of bright weather is necessary before any farm work can be undertaken. This inclement weather is materally injuring the prospect for a good cotton crop, as it is conducive to additional boll-weevil damage. In fact, reports indicate that this insect is already at work on the new plants in some localities.

Despite these unfavorable conditions, retail trade for the month shows a continued improvement. Sales by department stores in thirteen of the largest cities in the Sixth Reserve District show an increase over the preceding month, the total sales being for the first time in many months almost equal to those of the same month last year. Textile interests report an increase in the number of unfilled orders on hand, and improvement is to be noted in the iron and steel industry in Birmingham, three additional furnaces being in operation in this locality. Electrical jobbers report business as a whole improved, radio equipment especially being in brisk demand, while a heavy movement of wiring supplies within the next three months is anticipated.

Poles.—The movement of poles is reported as showing some improvement, recent inquiries for fair to good purchases being reported by jobbers. Prices as a whole are steady, though odd lots are being offered at figures considerably below market quotations. Pole-yard stocks are in good shape.

Pole-Line Hardware.—A fair to good volume of business is reported in this line, orders coming mostly from the larger central stations, though increased activity is to be noted in the municipal plant field. Prices have remained fairly steady for some time.

Lightning Arresters.—Sales of this specialty are on the increase, local contractors, jobbers and central-station companies purchasing for summer requirements. The compression type leads in popularity, with prices steady and stocks ample.

Rigid Conduit.—Business in this line is reported as good, with a price advance of from 2 to 5 per cent recently announced. No one particular size seems to be unusually active, the demand being divided proportionately among sizes up to 4-in., both in black and galvanized. Stocks are in good shape.

Flexible Non-Metallic Conduit.—This item continues its steady movement, stimulated by the wiring of old houses and ordinances abolishing knob and tube work in the business districts. Present quotations in lots of 5,000 ft. for two-wire, No. 14, are $51 per 1,000 ft.

Sewing Machines—This appliance is not responding to the usual spring demand, owing in all probability to inclement weather and the reduced purchasing power of the average householder.

Washing Machines.—Campaigns and aggressive sales work have not served to stimulate materially the movement of this article, sales being reported only in isolated instances and then only after aggressive sales effort. Jobbers' stocks are fair to heavy.

ST. LOUIS

That construction work in this territory is getting back into its stride is indicated by the building permits issued in St. Louis during May. The valuation placed upon them amounted to $2,396,880, as compared with $2,111,596 the month before and $1,087,195 in May, 1921. By far the greater portion of the work being done is residential, but new manufactories and workshops are increasing in volume. The permits for the latter class of construction last month amounted to $105,000 and covered five new buildings.

Retail conditions continue to show improvement except in the coal-mining districts, where the strike is in progress. There seems to be more confidence in values and in the future of business than at any time in the last eighteen months. From this confidence there are two notable results —retailers are stocking more than in the past, and agriculturists are entering with greater enthusiasm into heavier production of crops and live stock.

None of the industrials and central stations is as yet suffering from the coal strike, as mines in this district still have a large number of unconsigned loaded cars, and there have been fair shipments from Kentucky and other

fields. There is a possibility, however, of considerable trouble when the fall demand begins, because of transportation difficulties, unless the strike be terminated in the interim.

Lightning Arresters.—The demand has been quite active in the past few weeks, especially for 2,300-volt and 4,000-volt distribution circuits. The advantages in more complete lightning protection are being more fully realized by the municipal plants as well as the larger central stations. Local stocks are in good order and immediate shipment usually can be given.

Motors.—With improvement in industrial conditions, motor business is slowly gaining ground. There is a growing tendency toward individual drive, especially in the woodworking industry, and as a consequence most of the industrial motors being sold are smaller than 25-hp. in size.

Wire.—The demand showed little change last week, and no sensational orders were in sight. No. 14 rubber-covered had a steady call at $6 to $6.25 per 1,000 ft. in 5,000-ft. lots. The weatherproof base is around 16 cents per pound, and that of bare around 17 cents per pound. Ample stocks are on hand.

Fans.—Prevailing moderate temperatures have held back the early retail demand, and as a consequence movement all along the line has been quiet. Stocks are very conservative, so that a sudden hot spell would cause a rush on both the jobbers and manufacturers.

Sewing Machines and Motors.—Sewing machines have been slow movers, and the motors have not met with much demand until recently. A comparatively good amount of business in the latter item was reported last week.

SAN FRANCISCO

Sudden floods have inundated parts of the San Joaquin Valley. Many crops have been lost, but all in all, because of better irrigation, the crops, while not bumper, will rank high. Farmers are buying well and interior towns and cities report good business. Collections show a slight improvement, but new orders are carefully scrutinized by credit departments to cut down the very large outstanding accounts.

The value of the building permits for May, 1922, is: Los Angeles, $9,327,504; San Francisco, $4,377,066; Oakland, $2,167,322, and San Diego, $677,580. The corresponding values for May, 1921, were: Los Angeles, $7,433,760; San Francisco, $1,097,151; Oakland, $1,033,323, and San Diego, $416,298.

Farm Plants—Steadily improving sales are reported, well distributed among the sections covered, and a better averaging of sales is noticeable.

Rubber-Covered Wire.—No. 14 single-braid, solid, is selling in 5,000 ft. lots for $6.75 per 1,000 ft., with an approximate 10 per cent advance in coil lots. The recent 5 per cent advance caused brisk buying.

Pole-Line Hardware.—Prices generally have advanced about 10 per cent. An excellent movement well proportioned is reported in this line; judged by its showing over the past four seasons, it is a staple wth a demand that can be accurately forecast.

Bare Copper Wire.—The new base is $19 per 100 lb. Stocks are better. Radio business has caused a widespread stocking in small sizes and in small packages, and for a time the comparatively limited sources of supply could not cope with demand.

Tapes.—Commercial-grade ¾-in. friction tape is now bringing about 33½ cents per pound in 100-lb. lots for half-pound rolls. Rubber tape in the same assortment brings 30 cents per pound. Manson tape in 100-lb. lots sells for about 65 cents per pound and Okonite for about 85 cents. Local stocks are good, after several shortages in friction tape.

Household Material.—It is a little early to forecast the result of "June Bride" week, but the dealers are all making good displays and are realizing that they will get returns in proportion to the enthusiasm and sales effort they put into the event. At any rate, some method of calling popular attention to electrical devices is urgently needed.

PORTLAND—SEATTLE

Owing to unusually dry weather during the past month, together with the hot spell of the past week, a number of forest fires gained headway and burned standing timber, mill sites and railway property in western Washington, resulting in property damage estimated at something over $500,000. Because of the increased demand for lumber and lumber products a number of mills in the Puget Sound region have put on night shifts, beginning the first of June.

In some mills the minimum wage for common labor has been increased from $3 to $3.40 per day. Lumber production is still increasing and for the week ended May 27 was 12 per cent above normal. New business exceeded production by 10 per cent.

Building permits in Portland for May were 11 per cent greater in number than for May, 1921, and exceeded the value of permits for the same month this year, which was 37 per cent greater than last year. Electrical permits were 42 per cent in excess of those for May last year, and fees collected were the greatest in the history of the department.

During the first four months of 1922 Seattle's net increase in the wholesale sales covering four major lines was about 23 per cent. This is a good index of returning prosperity.

Electrical jobbers report business slightly improved. The warm weather of the past week has materially stimulated fan business, and with prospects for a warm summer, this business is expected to be exceptionally good for the next two or three months. As compared with the normal summer season, jobbers did not lay in a large stock of fans and the prospects are that stocks will run short.

Conduit.—One-half-inch black is quoted at $6.15 and galvanized at $6.70 per 100 in 10,000-lb. lots; ¾-in. black is quoted at $7.90, and galvanized at $8.70 per 100 lb. in similar quantities.

Flexible Armored Conductor.—Double-strip, No. 14, is quoted at $61.70 per 1,000 ft. in coil lots of 250 ft.

Outlet Boxes—Three-inch standard outlet boxes are quoted at $12 per 100 in standard-package quantities of 100. Four-inch boxes are $15 per 100 in similar quantities.

SALT LAKE CITY

Building permits in practically all important cities of the Intermountain region showed a healthy increase for May, 1922, over the corresponding month of last year. Permits were granted for the past month in Salt Lake City alone for 149 new constructions, with a total cost of over $500,000. This represents a decided advance over the record set for April of this year.

The lumber and allied industries are consequently experiencing a decided seasonal boom that is reflecting favorably on business generally. Builders' hardware is in good demand, with prices fairly stable.

A reduced price schedule covering many lines of electrical merchandise will become effective July 1. Jobbers expect a corresponding pick-up in general demand and dealers manifest a better buying tendency. As mining resumes on a better production scale, jobbers of electrical products note an improvement of the market. Copper plants are still going on a partial production schedule, but lead and silver properties are normally active. Lead recently reached the level of $5.65 per 100 lb., showing an advance of 15 cents in one record day.

Wire.—As construction work advances, the wire market shows steady improvement. The improved demand for copper is reflected in a stiffening tendency in wire. Rubber-covered wire made a recent jump of 1½ cents per pound and bare copper wire one of ½ cent per pound. Stocks are in excellent shape.

Conduit.—Stocks are in good condition, with a fairly good demand. No recent price fluctuations are noted.

Transformers.—This is a staple line, the market holding an even tendency. The power companies furnish a good market, with the prospect of steadily increased demand as development proceeds. There is no shortage of stocks.

Dishwashers.—This is another electrical device the sale of which lags.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Anaconda Copper Company Books 1,000,000-Lb. Wire Order

The Anaconda Copper Mining Company reports a good wire business on the Pacific Coast and states that it has booked an order for another 1,000,000 lb. of wire from the Pacific Gas & Electric Company. Two months ago the Anaconda company made a final shipment on a 10,000,000-lb. wire order for this concern. The Great Falls plant, which has a monthly capacity of 8,000,000 lb. of wire and rods, is operating at between 6,000,000 lb. and 7,000,000 lb. at present.

Holslag Wins Arc-Welding Patent Decision

Priority of invention of the alternating-current transformer type of arc-welding equipment has been awarded by the Patent Office to Claude J. Holslag. This equipment is manufactured under license by the Electric Arc Cutting & Welding Company, Newark, N. J.

This case of Waters versus Holslag, wherein Waters declared that he was the original inventor of the welding machine, started in the summer of 1920. The written record of the case is one of the most voluminous ever presented to the Patent Office. A total of forty-five witnesses were examined and testimony was taken in Schenectady, Albany, Peekskill and New York City. The case was decided May 22.

The entire testimony of more than 2,000 pages was gone into at great length by the Patent Office in a forty-page decision, in which it stated:

"Waters relies mainly on exhibits Holslag had written Waters while they were friends, which were satisfactorily explained by Holslag under cross-examination. These exhibits appeared to include Woticky in the alternating-current welding scheme, but inclusion of Woticky is explained in cross-question No. 1170, and both Holslag and Waters deny joint inventorship, and the evidence showed that Holslag is the actual inventor."

The General Electric Company attacked these patents on the grounds that one of Thomson's transformer patents was very similar, but the Patent Office allowed the broad transformer welding claims of Holslag in the following words:

"The gist of the broad invention is this new use for an old apparatus. *Ex post facto*, the applications seem obvious, but the long want for such an apparatus in the welding art, unsatsified, as appears from the record, until the present system for use of this apparatus long known and used in other relations was devised and found favor, indicates a high degree of invention."

Business Growth Forces Boston Distributer to Move

The Beaudette & Graham Company, 130 Federal Street, Boston, will move about July 1 to 915 Boylston Street, Boston, as a result of the rapid development of the company's business. W. H. Dalton, sales manager, informed the ELECTRICAL WORLD recently that the new quarters will not only occupy a larger area than the present space of the company, but will permit a consolidation of warehousing, service and merchandising facilities under a single roof, in place of the present scattered arrangement.

The demand for washing machines and refrigerating apparatus has been improving of late, and the company has recently taken the agency for "Emmonswood" radio apparatus, manufactured by the Boston Scale & Machine Company, Roxbury, Mass.

Travis Company New Representative of Pacific Electric

The Travis Engineering Company, consulting, designing and constructing, Kansas City, has been appointed a sales representative for the Pacific Electric Manufacturing Company in the Kansas City territory, officials of that company have announced.

Wagner Electric Announces Reorganization Plan

Provides for Issuance of $3,000,000 7 per Cent Preferred, $2,500,000 7 per Cent Bonds and 80,000 Shares No-Par Common

The proposed plan for reorganization of the Wagner Electric Company, which provides for the issuance of $3,000,000 in 7 per cent preferred stock, $2,500,000 in 7 per cent bonds and 80,000 shares of no-par common stock, has been announced in a letter of W. A. Layman, president of the company, to the stockholders. The plan is approved by the board of directors and unanimously indorsed by the stockholders' committee. A reorganization of the directorate is also planned.

The proposed financial plan is as follows:

To authorize 7 per cent cumulative preferred stock to the amount of $3,000,000, of which $1,500,000 is now to be sold; to authorize and sell bonds bearing interest at a rate not to exceed 7 per cent to the amount of $2,500,000; to authorize no-par-value common shares to the amount of 80,000 shares, of which approximately 58,270 are to be exchanged, share for share, with the holders of the present common stock; 20,000 shares to be used to accomplish the reorganization and refinancing of the company, and the balance of which is to remain in the treasury for future use.

The $1,500,000 of preferred shares are to be offered to the stockholders at par, or $100 per share, with a bonus of two-thirds of one share of no-par common with each share of preferred stock taken. During the last seven fiscal years, according to the latter, the average annual earnings applicable to dividends have been approximately three times the annual dividend requirements of the proposed preferred stock.

With the placing in effect of the new financing a new board of directors is proposed with the following membership: V. W. Bergenthal, assistant treasurer of the company; James M. Buick, vice-president of American Car & Foundry Company; Guilford Duncan, president of Ludlow-Saylor Wire Company; James H. Grover, vice-president of St. Louis Union Trust Company; John F. Lee, attorney; W. A. Layman, president of the company; Stewart McDonald, president of Moon Motor Car Company; E. J. Miller, president of St. Louis Screw Company; J. Herndon Smith, of Smith-Moore & Company, and Harry J. Steinbreder, president of Fulton Iron Works.

Regarding the operations of the current year, Mr. Layman makes the following statement: "The electrical business of the country as a whole is showing a marked revival. Our production operations at the present time are on a basis of approximately 50 per cent of the capacity of our plant facilities. Incoming business is at the rate of approximately 70 per cent of the capacity of the plant. The number of employees of the company has increased from 1,219 on Jan. 1, 1922, to approximately 1,900 for the week ended May 20. There is every indication from the steady increase of our sales that the operations of the year will show a profit after payment of interest on bonds, dividends on new preferred stock and making adequate provision for physical depreciation of property. If the improvement in business which has been experienced since Jan. 1 continues throughout the year, within six months substantially the entire manufacturing facilities of the company will be occupied."

New Departure Company Adds 800 Men to Payroll

That 800 men have been added to the payroll of the New Departure Company at the Bristol and Elmwood plants in the last two months is announced by officials of that company. The larger part of this increase has occurred in the last month. It is interesting to note, says the announcement, that the present force is nearly three times what it was before the war.

Worthington Pump Announces Purchase of Camden Records

The Worthington Pump & Machinery Corporation, 115 Broadway, New York City, announces that it has purchased all drawings, records and patterns covering centrifugal pumps and pumping engines manufactured by the Camden Iron Works, Camden, N. J., and formerly sold either direct or through R. D. Wood & Company, Philadelphia, and other agents.

Chicago Firm to Represent Many Electrical Lines

The Manufacturers' Electrical Corporation, 123 West Madison Street, Chicago, is one of the latest organizations to enter the field as representatives in the Middle West for manufacturers of electrical equipment ranging from motors to wiring materials. Edgar Switzer, for the past ten years with the Westinghouse Electric & Manufacturing Company, has resigned his position to become vice-president and general manager of the Manufacturers' Electrical Corporation. Mr. Switzer, while outlining the plans of the new company to a representative of the ELECTRICAL WORLD, pointed out the need for a selling company for manufacturers specializing in the production of lines that were somewhat limited. Closer relationships could be established by better and more frequent contacts with the buyers by a company solely devoted to distribution problems than could be obtained by a manufacturer of a single product. The capital stock consisting of $25,000 of preferred stock and 1,000 shares of non-par value has all been sold.

Increased Demand for Domestic Power Apparatus

Since April 1 the demand for motor-driven equipment for various classes of domestic service has increased materially, according to Philip Atwater, manager Boston office, Home Electric Power & Equipment Company, agents for "Delco Light" products. Mr. Atwater informed a representative of the ELECTRICAL WORLD last week that in the past ten weeks about thirty electric refrigerating plants have been sold through this office, including a single order for five equipments from the Rhode Island Hospital at Providence and two equipments for John Hayes Hammond, Gloucester, Mass. This represents a striking increase over the sales rate of the past two years. The demand for lighting equipment is also picking up at present, and increased interest has followed price reductions announced several weeks ago. Farm business is somewhat spotty, depending upon local prosperity, but conditions in both Vermont and New Hampshire are steadily improving. Mr. Atwater also said that the demand for the new duplex type of washing machines recently placed on the market by the company is so marked as to make it impossible to build up local stocks to any extent at present.

The demand for motor-driven pumping plants is very active, following a recent price reduction of $55 on a representative outfit.

Westinghouse Domestic Sales Committee Is Augmented

The activities of the large sales force of the Westinghouse Electric & Manufacturing Company are directed by a committee composed of the heads of various departments of the company. This body is known as the domestic sales committee, and it holds meetings monthly for the discussion of business conditions and sales policies and for the purpose of formulating action to keep the sales of the company on the upward grade.

H. D. Shute, vice-president in charge of sales, is chairman of the domestic sales committee, and Roscoe Seybold, manager of price statistics, is secretary.

The committee was augmented recently when the supply department was reorganized and the new merchandising department of the company was established.

The Pacific States Electric Company, electrical jobber, San Francisco, has recently taken on the line of "Red Spot" lighting specialties, manufactured by the F. W. Wakefield Brass Company, Vermilion, Ohio.

The Elliott Company, manufacturer of power accessories, Jeannette, Pa., announces the following changes in its organization. W. E. Widau, formerly of the Cleveland office, has been made assistant general sales manager; J. R. Lemon and S. B. Overton have been added to the sales force of the Philadelphia office; R. K. Williams has been added to the sales force of the Cleveland office and W. T. Bickel to that of the Pittsburgh office. In addition to Elliott products the latter four men will sell the products of the Liberty Manufacturing Company, Pittsburgh, and the Lagonda Manufacturing Company, Springfield.

The Hygrade Lamp Company, Salem, Mass., has let the contract for the construction of a four-story 50 ft. x 100 ft. brick and steel addition to its factory on Boston Street, that city. The new building will afford the company 20,000 sq.ft. of additional floor space and will cost about $75,000.

The Illinois Electric Company, electrical supply jobber, Chicago, has purchased a block of property at Boyd and San Pedro Streets, Los Angeles, where a modern warehouse and office building will be erected for its Los Angeles branch. This, according to C. B. Hall, manager of the Los Angeles branch, is the first step in a program of expansion in the Southwest territory. The new building will have more than 35,000 sq.ft. of floor space with provisions for future additions.

DOMESTIC SALES COMMITTEE, WHICH WAS ENLARGED RECENTLY, OF THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

Front row, left to right: John J. Gibson, assistant to vice-president in charge of merchandising and supply departments; G. Brewer Griffin, manager of automotive equipment department; W. S. Rugg, assistant to vice-president; H. D. Shute, vice-president in charge of sales; E. H. Sniffin, manager of power department; J. C. McQuiston, manager publicity department.

Back row, left to right: Charles Robbins, assistant to vice-president; Roscoe Seybold, secretary of domestic sales committee; J. S. Tritle, manager of merchandising department; D. D. Faris, assistant manager of marine department; T. J. Pace, manager of supply department; W. K. Dunlap, acting vice-president; J. M. Curtin, manager of industrial department; M. B. Lambert, manager of railway department; A. A. Brown, manager of syndicate operations.

Foreign Trade Notes

PROPOSED ELECTRIC TRAMWAY IN SEVILLE, SPAIN.—Application has been made by the Compañia Tranvia de Sevilla, the *Electrical Review* states, for a concession to construct an electric tramway in Seville.

LOAN FOR AUSTRALIAN TELEPHONE LINES.—A foreign loan of £2,000,000, according to *Commerce Reports*, has been authorized by the Australian government for the Postmaster-General's Department in connection with the construction of trunk, telegraph lines, telephone lines and other telephone work. In January the post office officials asked for a loan of £8,000,000 for this purpose.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An importing firm in Spain (No. 2,312) wishes to purchase aluminum sheets for automobile bodies and machinery for working same and electric ovens for varnishing and enameling automobiles.

The purchase is desired of electrical supplies, novelties, toys, etc., by a merchant in Spain (No. 2,319).

A firm of commission agents in Italy (No. 2,323) desires to secure an agency for the sale of electrical articles, motorcycles, etc.

A mercantile firm in Belgium (No. 2,340) desires to purchase and secure an agency on consignment for small electrical appliances, including lamps, flatirons, sweepers, etc.

The purchase is desired by a municipality in Canada (No. 2,350) of meters for electric current applied to kitchen ranges, alternating current, 60 cycles, 110 volts.

Dealers in optical goods in Italy (No. 2,353) wish to purchase and secure an agency for electric lamps and electrical goods in general.

The purchase of electrical supplies, novelties, etc., is desired by a merchant in Spain (No. 2,364).

AUTOMATIC SWITCHBOARDS FOR MELBOURNE.—Tenders will be received by the Postmaster-General's Department, Melbourne, Australia, until Oct. 17, according to the *Electrical Review*, for automatic switchboards and accessories for two suburban exchanges at Melbourne.

ELECTRIFICATION OF BOLOGNA-MONFALCONE (ITALY) RAILWAY.—The Director-General of Italian State Railways, according to the *Electrical Review*, announces an extension of date from April 30 to July 31, 1922, for receiving tenders for the electrification of the Bologna-Venice-Monfalcone Railway.

ELECTRICAL APPARATUS FOR NEW ZEALAND.—Tenders are being asked by the Southland Electric Power Board, Wellington, New Zealand, to close in September, the *Electrical Review* states, for electrical apparatus, including transformers, cables, switches, insulators, etc.

New Apparatus and Publications

WATT-HOUR-METER ATTACHMENT.—A demand attachment for use with a standard type "OA" polyphase watt-hour meter for small power installations is being manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

LIGHTING CALCULATOR.—"The Westinghouse Pocket Lighting Calculator," designed by the Illuminating Engineering Bureau of the Westinghouse Companies, has been published by the Westinghouse Lamp Company, 165 Broadway, New York City.

METAL STATISTICS.—The fifteenth annual edition of "Metal Statistics," 1922, has been published by the American Metal Market and Daily Iron and Steel Report, 81 Fulton Street, New York City.

RANGES.—The Simplex Electric Heating Company, 15 South Desplaines Street, Chicago, is distributing a folder covering various types of the "Simplex" electric ranges.

PORTABLE INSTRUMENTS.—The Jewell Electrical Instrument Company, 1640 West Walnut Street, Chicago, has issued a bulletin which describes two new garage testing meters.

INSULATOR TEST.—The Lapp Insulator Company, Inc., Le Roy, N. Y., is distributing bulletin No. 88, describing the Lapp "Overpotential" insulator, a new feature in high-voltage insulator production.

RECEPTACLES AND ACCESSORIES.—"Elexits-Places for Lights" is the title of an eight-page pamphlet issued by the Bryant Electric Company, Bridgeport, Conn., covering its various types of standard receptacles and accessories

RHEOSTATIC CONTROL.—A four-page leaflet issued by the Allen-Bradley Company, Milwaukee, describes and illustrates the "Bradleystat" filament control for adjustment of radio vacuum-tube filament current.

REFLECTORS.—The Benjamin Electric Manufacturing Company, 847 West Jackson Boulevard, Chicago, is distributing a leaflet calling attention to its "Elliptical Angle" reflectors, designed for sign illumination.

FAN STAND.—A new fan stand has recently been placed on the market by the Crucet Manufacturing Company, 292 Fifth Avenue, New York City.

ELECTRIC LAMPS.—The Duplex Lighting Works of General Electric Company, 6 West Forty-eighth Street, New York City, has recently brought a new development in lighting, known as "Filterlite." The company has also added a new floor lamp and two table lamps to the "Duplex" line of lighting products.

RADIO APPARATUS.—The Beaver Machine & Tool Company, 625-643 North Third Street, Newark, N. J., is distributing a four-page folder covering its new "Beaver Baby Grand" vest-pocket portable radio receiving set.

INDUSTRIAL EQUIPMENT.—Nathan Klein & Company, 208 Centre Street, New York City, dealers in electrical and industrial equipment, has issued catalog R, covering various types of industrial equipment, including electric motors, portable drills, welding apparatus, machine tools, etc.

ELECTRICAL APPARATUS.—The Mutual Electric & Machine Company, Detroit, Mich., has issued its apparatus division catalog for 1922, covering its "Bulldog" line of safety switches, switchboards, panelboards, cabinets, etc.

ELECTRIC NEWS BULLETIN MACHINE.—No. 78, Vol. IV, of the *Cutler-Hammer Bulletin*, issued April 22, describes the new type of electric news bulletin machine recently brought out by the Cutler-Hammer Manufacturing Company, Milwaukee.

TRUCK SKID.—The Cowan Truck Company, 7 Water Street, Holyoke, Mass., is distributing a four-page folder describing the "Cowan" steel frame-lift truck skid, designed for use with hand and electric lift trucks.

OIL COOLER.—Bulletin No. 904 issued by the Griscom-Russell Company, 90 West Street, New York City, describes its "Multi-whirl" cooler for the cooling of oil and water in connection with Diesel engines.

RESISTANCE THERMOMETER.—A new direct-reading resistance thermometer designed for measuring temperature has recently been developed by the Brown Instrument Company, Philadelphia.

ARMATURE COIL TAPING MACHINE.—A self-feeding kickless armature coil-taping machine has recently been brought out by the P. E. Chapman Electrical Works, corner of Tenth and Walnut Streets, St. Louis.

METAL BASE.—A new device has been developed by Pass & Seymour, Inc., Solvay, N. Y., known as the "All Metal" BR base for use for all concealed outlets. A complete series of adapters has been developed to secure this base to all forms of outlets.

New Companies

THE AMERICAN SUPERPOWER CORPORATION, Lewiston, N. Y., has been incorporated with a capital stock of $10,000 to operate an electric light and power system in that section. The incorporators are J. Boardman Scovell, Lewiston; Edward C. Randall and A. M. Layton, Buffalo, and Frederick W. Ballard, Cleveland.

THE PLAINVILLE ELECTRICAL PRODUCTS COMPANY, Plainville, Conn., has been incorporated by F. L. Benzon, H. E. Smith and Donald Benjamin, all of Plainville. The company is capitalized at $50,000 and proposes to manufacture all kinds of electrical parts and supplies.

Record of Electrical Patents

Notes on United States Patents

(Issued May 16, 1922)

1,416,061. RADIO-RECEIVING SYSTEM HAVING HIGH SELECTIVITY; Michael I. Pupin, Norfolk, Va. App. filed Dec. 18, 1917.

1,416,077. SYSTEM FOR ELECTRICAL SIGNALING; De Witt C. Tanner, Glen Ridge, N. J. App. filed March 8, 1919. Two-element electron tube used as modulator.

1,416,088. TELEPHONE EXCHANGE SYSTEM; Edward E. Clement, Washington, D. C. App. filed March 14, 1905. Combination of automatic and manual devices.

1,416,089. ELECTRIC HIGH-VELOCITY CLASSIFIER; Carl W. J. Hedberg, New Britain, Conn. App. filed Nov. 26, 1919. Separates suspended particles from gases.

1,416,099. FOLDING MACHINE; Roy S. Latimer, Troy, N. Y. App. filed April 12, 1917. Heating of machines for folding fabric blanks.

1,416,124. ELECTRIC LIGHT FIXTURE; Paul J. Pfeifer, Cleveland, Ohio. App. filed July 11, 1921. Bracket for side lights.

1,416,181. CAR BRAKE; Robert Z. Farmer and George S. Marsh, Roseburg, Ore. App. filed Nov. 8, 1919. Operated directly by electric motor.

1,416,183. WELDING ELECTRODE; Joseph W. Fay, Milwaukee, Wis. App. filed June 24, 1921. Covered with cement and insulated paper.

1,416,192. CONDUCTOR RAIL; Edwin B. Grace and William Laffey, Memphis, Tenn. App. filed March 18, 1921. Three-conductor collector for cranes.

1,416,195. ELECTRIC STORAGE BATTERY; Edward Hacking, Central Falls, R. I. App. filed April 30, 1918. Has solid electrolyte.

1,416,197. MANUFACTURE OF INCANDESCENT ELECTRIC LAMPS; Francis Harrison, London, England. App. filed July 8, 1910. Method of renewing lamp filaments.

1,416,214. STORAGE-BATTERY VENTILATING SYSTEM; Charles C. King, Bridgeport, Conn. App. filed Sept. 5, 1919. Used in submarine boats.

1,416,225. ELECTRIC HEATER; Francis M. May, Louisville, Ky. App. filed June 13, 1921. Heater draws air from outside street car.

1,416,226. TELEPHONE EXCHANGE SYSTEM; Henry L. Meade, New York, N. Y. App. filed July 14, 1920. Common telephone connection for offices.

1,416,236. ELECTRICAL SYSTEM; Franklin Punga, Liège Belgium. App. filed Sept. 25, 1911. Charging of automobile batteries.

1,416,254. SELF-WINDING CLOCK MECHANISM; Charles E. Boillot, Brooklyn, N. Y. App. filed July 12, 1919.

1,416,256. DYNAMO-ELECTRIC MACHINE ARMATURE; Henry E. Borger, Newark, N. J. App. filed Dec. 30, 1916. Design of small motors and generators.

1,416,263. ELECTRIC FIRELESS COOKER; William Campbell, Detroit, Mich. App. filed Dec. 5, 1921.

1,416,265. INHERENTLY REGULATED DIRECT-CURRENT DYNAMO; Hans Charlet, Krefeld, Germany. App. filed July 8, 1920. Automobile motor and generator.

1,416,272. ELECTRIC TOASTER; Edmond C. Floriot, New York, N. Y. App. filed Nov. 5, 1921.

1,416,273. ELECTRIC POWER TRANSMISSION AND CONTROL; Ethelbert M. Fraser, Yonkers, N. Y. App. filed March 16, 1916. Gasoline-electric automoboile.

1,416,275. SANITARY TELEPHONE MOUTHPIECE; Abraham A. Freedman, Chicago, Ill. App. filed May 11, 1921.

1,416,306. DRIVING MEANS FOR PHONOGRAPHS; Henry K. Sandell, Chicago, Ill. App. filed April 17, 1919. Motor rotor fastened to under side of table.

1,416,320. HEAT EXCHANGER; Hjalmar V. Barclay, New York, N. Y. App. filed Feb. 14, 1919. Closed circulating system.

1,416,326. ELECTRIC STARTER FOR INTERNAL-COMBUSTION ENGINES; Frederic Billion, Solothurn, Switzerland. App. filed Jan. 18, 1922.

1,416,327. STORAGE-BATTERY CONSTRUCTION; Robert S. Blair, Sound Beach, Conn. App. filed May 9, 1919. One filling hole for all cells.

1,416,340. ANNUNCIATOR; William T. Dippel, New York, N. Y. App. filed May 27, 1919.

1,416,359. METHOD OF SIDE-WELDING WIRES; Laurence S. Lachman, New York, N. Y. App. filed July 12, 1920. By electric resistance welding.

1,416,360. ELECTRIC WELDING DEVICE; Laurence S. Lachman, New York, N. Y. App. filed July 12, 1920. For wire mesh or network.

1,416,398. TROLLEY GUARD; George G. Cooper, Hillsboro, Ill. App. filed Oct. 7, 1921. Wire clamp has lateral arms.

1,416,403. METHOD AND MEANS FOR CLEANING SILVER, GOLD, PLATINUM AND OTHER ARTICLES; Wilbur W. Everts, Rochester, N. Y. App. filed July 6, 1918. Articles immersed in salt solution with a bi-metal.

1,416,436. ELECTRICAL HEATING ELEMENT; Percy A. E. Armstrong, Loudonville, N. Y. App. filed May 1, 1919. Alloy of iron and chromium.

1,416,446. ELECTRICAL CONTROLLING DEVICE; Dawson J. Burns, Bronxville, N. Y. App. filed June 14, 1919. Adjustable rheostat.

1,416,449. ELECTRIC ARC WELDING; Alexander Churchward, New York, N. Y. App. filed Feb. 18, 1920. Current regulated by solenoid-operated carbon pile.

1,416,450. ELECTRIC WELDING METHOD AND APPARATUS; Alexander Churchward, New York, N. Y. App. filed June 26, 1920. Automatic control for several arcs.

1,416,459. ELECTRIC HEATER; Edward E. Gold, New York, N. Y. App. field Jan. 8, 1920. For passenger vehicles, etc.

1,416,481. ELECTRIC HEATING PAD; Antonio Longoria, Cleveland, Ohio. App. filed Feb. 18, 1920. With thermostatic control.

1,416,482. CONTROLLING DEVICE FOR ELECTRIC HEATERS; Antonio Longoria, Cleveland, Ohio. App. filed June 30, 1920. Condenser prevents arcing on thermostatical breaker.

1,416,485. ELECTRICAL INDICATING SYSTEM; William A. Lurie, New Orleans, La. App. filed Nov. 17, 1919. Shows if hotel-room doors are locked.

1,416,513. GENERATOR FOR ELECTRIC LAMPS; Sylvain Rosengart, Paris, France. App. filed Oct. 23, 1918. Portable flashlight.

1,416,527. ELECTRIC FIRELESS COOKER; Percival J. Townsend, Redwood City, Cal. App. filed May 25, 1920. Element embedded in soapstone.

1,416,535. TROLLEY GUARD FOR TUNNELS; Cyrus T. Whaley, Norfolk, Va. App. filed Oct. 17, 1921. Conductor fastened to inverted channel.

1,416,536. TROLLEY GUARD FOR TUNNELS; Cyrus T. Whaley, Norfolk, Va. App. filed Oct. 17, 1921. Inverted channel.

1,416,544. HEAT-CONTROLLING DEVICE; Richard G. Barzen, Kansas City, Mo. App. filed March 30, 1921. Electric iron with thermostatic cutout.

1,416,572. FLUID METER; Horace N. Packard, Milwaukee, Wis. App. filed March 27, 1918. Thermal type.

1,416,584. METHOD OF PRESERVING ELECTRIC FURNACE LININGS; Hugh C. Sicard, Buffalo, N. Y. App. filed Feb. 12, 1920. By smelting titaniferous ore and iron to form lining.

1,416,592. CLOCK-CIRCUIT CONTROL DEVICE; George A. Albright, Atlanta, Ga. App. filed Feb. 4, 1920. Mercury contact

1,416,601. COMBINED HEATER AND VENTILATOR; Robert G. Boone, Asbury Park, N. J. App. filed Sept. 7, 1920. Electrical element with motor-driven fan.

1,416,607. LAMP SOCKET; Walter M. Carter, Portsmouth, Va. App. filed Feb. 11, 1919.

1,416,611. ELECTRICAL DRIVING MEANS; E. L. P. Colardeau. App. filed Oct. 27, 1917. Vehicles with two motors and engine-driven generators.

1,416,612. ELECTRIC MOTOR; E. L. P. Colardeau, Paris, France. App. filed Nov. 13, 1919. Control system for multiple-unit train.

1,416,623. ELECTRIC DISCHARGING TUBE; Bruno Donath, Friedenau, Germany. App. filed Oct. 1, 1914. Improved covering for cathode.

1,416,634. PROCESS AND APPARATUS FOR CONCENTRATION AND SEPARATION OF DIAMAGNETIC MINERALS; Willard C. Hall, Butte, Mont. App. filed Aug. 4, 1921. By induction.

1,416,642. CALL-BOX CONTACT MECHANISM; George W. Janson, Brooklyn, N. Y. App. filed July 2, 1920. Signal transmitter.

1,416,663. TELEPHONE REPEATER; Bernard C. Groh, St. Paul, Minn. App. filed March 13, 1916. For automatic or semi-automatic telephone systems.

(Issued May 23, 1922)

15,364 (reissue). ELECTRICAL RIVETING; Albert B. Rypinski, Brooklyn, N. Y. App. filed Jan. 20, 1921. Rivets metal and non-metallic plates together.

1,416,688. ELECTRIC HEATER; Samuel M. Carmean and James H. Carmean, Kansas City, Mo. App. filed Sept. 12, 1921. Fan and electric heater combined.

1,416,692. ELECTROLYTIC APPARATUS AND METHOD; Christian Dantsizen, Schenectady, N. Y. App. filed May 21, 1920. Deposition of iron on tungsten or molybdenum plates.

1,416,704. ELECTRIC BATTERY; Harry F. French, Fremont, Ohio. App. filed April 26, 1920. Dry cells of deferred-action.

1,416,724. TELEPHONE CIRCUITS; George W. Kuhn, Brooklyn, N. Y. App. filed March 16, 1918. Testing circuit.

1,416,738. BATTERY CONSTRUCTION; Albert L. Muren, Burlington, Iowa. App. filed Jan. 11, 1919. Electrolyte contains alkaline tungstate.

1,416,750. HEATER FOR WAVING HAIR; Ziva Popin, New York, N. Y. App. filed May 17, 1919. Hair pressed between cylindrical shells.

1,416,751. ELECTRICAL RECORDING APPARATUS; R. W. Press and C. W. Schwenzfeier, Glassboro, N. J. App. filed April 19, 1920. To keep performance records of machines.

1,416,761. STORAGE-BATTERY SEPARATOR; Godfrey Steerup, Chicago, Ill. App. filed Aug. 11, 1919. Diatomaceous earth formed into plate.

1,416,765. CIPHERING DEVICE; Gilbert S. Vernam, Brooklyn, N. Y. App. filed July 23, 1920. Enciphers and decipers telegraph messages.

1,416,774. DEVICE FOR RECEIVING RADIO SIGNALS; Cedare Bardeloni, Rome, Italy. App. filed April 17, 1920. Uses electron tubes.

1,416,787. METHOD OF PREPARING PASTE; Campbell C. Carpenter, Niagara Falls, N. Y. App. filed April 19, 1920. For storage-battery plates.

1,416,788. STORAGE-BATTERY PLATE; Campbell C. Carpenter, Niagara Falls, N. Y. App. filed Aug. 3, 1917. Prevents treeing from plate to plate.

1,416,789. MAGNETO GENERATOR; William H. Chapman, Portland, Me. App. filed May 5, 1919. To neutralize stauc in paper, wool and other processes.

1,416,802. IGNITION SYSTEM; Henry T. Duket, Toledo, Ohio. App. filed June 15, 1917. Ignition and starting apparatus for automobile.

1,416,804. CONTROL APPARATUS; Earl R. Evans, Great Barrington, Mass. App. filed Feb. 5, 1921. Drum-type motor controller.

1,416,824. GALVANOMETER; Charles F. Hindle, Elmhurst, N. Y. App. filed July 2, 1917. String galvanometer.

1,416,839. CLAMP FOR WELDING-MACHINE ATTACHMENTS; Harry W. Kranz and John Lukes, Cleveland, Ohio. App. filed May 24, 1920. Welding ends of circular band or rim.

1,416,851. THERMOSTATIC REGULATING OR CONTROLLING APPARATUS; Alfred H. McNeil, Chingford, England. App. filed Jan. 23, 1918. For temperatures to 1,000 deg. Fahr.

1,416,860. MACHINE FOR COLLECTING WASTE METAL ARTICLES; William Nelesen, Sheboygan, Wis. App. filed June 15, 1920. Truck equipped with magnets.

1,416,872. ELECTRIC HEATER; J. R. Quain, London, England. App. filed July 26, 1920. Silica used to inclose element.

1,416,879. PROCESS OF MAKING COMPOSITE METAL ARTICLES; J. F. R. Rousseau, Indianapolis, Ind. App. filed April 15, 1920. Making bearings, cam shafts, etc., by welding process.

1,416,883. METHOD OF SPOT WELDING; Jacob C. Sander, Lynn, Mass. App. filed May 10, 1920.

1,416,897. ELECTRIC HEATER; Maurice Simon, St. Louis, Mo. App. filed July 12, 1920. Inserted in walls of water tank.

1,416,908. FLUID RHEOSTAT; Benjamin F. Tillson, Franklin, N. J. App. filed Sept. 15, 1920. Automatic control of fluid temperature.

1,416,910. TIME-CONTROLLED REMINDER APPARATUS; Samuel Toy, Boston, Mass. App. filed March 16, 1921. Electrically operated yearly calendar.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

PORTLAND, ME. — The Cumberland Power & Light Company is planning to lay underground conduits on several streets in the city.

BOSTON, MASS.—An appropriation of $25,000 has been made by the board of directors of Wentworth Institute for the purchase of equipment and to complete plans for alterations in the chemical and electrical laboratories.

NEWBURYPORT, MASS.—The Newburyport Gas & Electric Company has issued $650,000 in bonds, part of the proceeds to be used for extensions and improvements.

QUINCY, MASS.—The Quincy Electric Light & Power Company has been granted permission to issue $250,000 in bonds and $100,000 in capital stock, part of the proceeds to be used for extensions and improvements.

BRIDGEPORT, CONN.—A movement has been started to install an ornamental lighting system on Stratford Avenue from Seaview Avenue to the city line, to cost about $50,000.

DANBURY, CONN.—A one-story power plant will be erected by the Tweedy Silk Mills, Inc., at its local factory.

Middle Atlantic States

BROOKLYN, N. Y.—The Brooklyn Edison Company contemplates extensions and improvements to its substation at Rodney and Analie Streets, to cost about $50,000.

BUFFALO, N. Y.—A power plant will be installed in the new building to be erected by the Buffalo Athletic Club on Niagara Square, to cost about $2,000,000. Edward B. Green & Son, Buffalo, are architects.

CATSKILL, N. Y.—The United Hudson Electric & Railroad Company has awarded a contract to the Fred T. Ley Company, Springfield, Mass., for the construction of a one-story substation, to cost about $50,000.

DUNKIRK, N. Y.—At a special election held May 24 the proposal to issue $1,400,000 in bonds for a hydro-electric plant was defeated.

MOUNT MORRIS, N. Y.—The Niagara Falls (N. Y.) Power Company is said to be arranging for the purchase of the property of the Mount Morris Illuminating Company and will furnish service to this section and eventually to the Genesco Gas & Light Company, Genesco.

WATERVLIET, N. Y.—The London Turbine Company will build a power house in connection with its proposed local plant for the manufacture of turbine engines, to cost $150,000.

CAMDEN, N. J.—The Board of Freeholders is preparing plans for a central power plant at Asyla for county service, to cost about $90,000.

NEWARK, N. J.—The National Oil & Supply Company, 180 Frelinghuysen Avenue, will build a one-story power house at its plant.

NEWARK, N. J. — The Public Service Electric Company contemplates the construction of two large substations in connection with extensions to its Essex, Marion and Burlington generating plants.

PASSAIC, N. J.—Steps have been taken by the Eastside Business Men's Association for an ornamental lighting system on Second Street.

TRENTON, N. J.—The John A. Roebling's Sons Company will increase the output of the power house at its wire and cable mills from 8,000 hp. to 12,000 hp.

TRENTON, N. J.—Bids will be received by the City Commission, City Hall, Trenton, until June 16 for furnishing and erecting at the Trenton pumping plant, an Ames "Una-flow" engine, one Root rotary pump, electric generator, condenser and atmospheric check valve. Plans and specifications may be obtained at the office of superintendent of water works, City Hall.

TRENTON, N. J.—The Trent Tile Company, Klagg Avenue, will build a new one-story power house, 30 x 50 ft., at its plant.

CANADENSIS, PA.—George W. Backoff, 40 Park Place, Newark, N. J., will take bids at once for the erection of a power house in connection with a new hotel here.

GREENSBURG, PA.—A central power house will be built in connection with a number of new buildings, to be erected at the Westmoreland Hospital, to cost about $500,000. Edward P. Mellon, 52 Vanderbilt Avenue, New York, is engineer.

HARRISBURG, PA.—Bids will be received by the Board of School Directors of the school district of the city of Harrisburg until June 23 for work in connection with units C-1, C-2 and C-3 of Senior High School, including general construction, electric wiring, boiler-room blowers, coal and ash-handling devices, generators, main switchboard, engines, etc. Plans and specifications may be seen at the office of Charles Howard Lloyd, Suite 701-A, Telegraph Building, Harrisburg.

JOHNSONBURG, PA.—The Council has voted to make improvements and extensions in the lighting system; 400-cp. units will be installed in the business section.

KINGSTON, PA.—The Luzerne County Gas & Electric Company has issued $1,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

NEW CASTLE, PA.—The Pennsylvania-Ohio Electric Company has issued $1,950,000 in bonds, part of the proceeds to be used for extensions and improvements.

PHILADELPHIA, PA.—The Philadelphia Electric Company will build an addition to its substation at Ontario and J Streets.

RIDGWAY, PA.—The Keystone Power Corporation has issued $1,750,000 in bonds, the proceeds to be used for the purchase of the property of the Keystone Electric Service Corporation in Elk and McKean Counties and for the construction of a new hydro-electric generating plant in the vicinity of Keating.

WESTON, PA.—The Weston Light & Power Company has been organized to install and operate a light and power system in Weston. George Puhak, Hazleton, Pa., is president.

WOMELSDORF, PA.—A company is being organized to purchase the municipal power plant at Charming Forge for $30,000. Extensions and improvements will be made to the system, to cost approximately $25,000.

WILMINGTON, DEL.—The Street and Sewer Department has awarded a contract to the Wilmington & Philadelphia Traction Company for the installation of an ornamental lighting system on King Street, from Front to Tenth Street. An underground conduit system will be installed.

BLUEFIELD, W. VA.—The Appalachian Power Company contemplates extensions and improvements to its system.

DANVILLE, VA.—Bonds to the amount of $100,000 have been voted for extensions and improvements to the municipal electric plant.

FORT MYER, VA.—Bids will be received at the office of the construction quartermaster, Room 2,306 Munitions Building, Washington, D. C., until June 13, for repairs to the local electric lighting system.

HAMPTON ROADS, VA.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., will soon call for bids for coal and ash-handling equipment at the local naval base. (Specification 4667.)

SOUTH HILL, VA.—The Council has awarded a contract to A. H. Guion, Gastonia, N. C., for the construction of a municipal electric plant. The J. B. McCrary Engineering Corporation, Atlanta, Ga., is engineer.

WASHINGTON, D. C.—Bids will be received by the Board of Awards Department of Agriculture, until June 27 for the installation of a 300-hp. water-tube boiler and auxiliary equipment at the department power house.

North Central States

SHEBOYGAN, MICH.—The Sheboygan Light & Power Company has been granted permission to issue $45,000 in bonds, the proceeds to be used for extensions and improvements.

SNOVER, MICH.—The Snover Light & Power Company, recently organized, contemplates the installation of a local distributing system. Charles L. Bell heads the company.

CINCINNATI, OHIO.—The Cincinnati Gas & Electric Company has issued $6,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

CLEVELAND, OHIO.—Bids will be received by the clerk of the board of education of the city school district of the city of Cleveland, Room 104, School Headquarters, Rockwell Avenue and East Sixth Street, until June 12 for electric wiring, fixtures and reflectors for the East Technical High School. Frank G. Hogen is director of schools.

NEW PHILADELPHIA, OHIO.—The Ohio Public Service Company is negotiating for the purchase of the plants of the Zoar (Ohio) Electric Company, Zoar and the Sugarcreek (Ohio) Electric Company. The Ohio company contemplates transmission line extensions in these districts and station improvements. J. Hall Truman is superintendent of the local district.

YOUNGSTOWN, OHIO.—The Council has authorized extensions to the ornamental lighting system in the business district.

LOUISVILLE, KY.—Permits have been granted for the construction of a warehouse building with power plant at First and Main Streets by the Belknap Hardware & Manufacturing Company. The cost of the building is estimated at about $1,200,000.

INDIANAPOLIS, IND.—The Dusenberg Auto & Motor Company, West Washington and Harding Streets, contemplates building a one-story power house.

MITCHELL, IND.—The Orange County Public Service Company has contracted with the Interstate Public Service Company for power supply, for distribution at Mitchell, Orleans and Paoli. Service will be rendered from Bedford.

OSGOOD, IND.—The municipal electric light plant was recently destroyed by fire. At present the town is without electrical service.

SOUTH BEND, IND.—The Indiana & Michigan Electric Company is reported to have awarded contract for extensions to its South Bend plants to increase the output by 15,000 hp. The cost is estimated at $1,250,000.

HILLSBORO, ILL.—The Southern Illinois Light & Power Company has issued $1,200,000 in bonds, the proceeds to be used for the purchase of the property of the St. Clair County Gas & Electric Company, Belleville, and for extensions and improvements.

MILWAUKEE, WIS.—Bids will be received by the Sewerage Commission until June 16 for superstructures for main power house and boiler plant, 90 ft. x 225 ft. and 68 ft. x 166 ft. respectively, on Jones Island. T. C. Hatton is engineer of sewerage commission.

ST. LOUIS, MO.—The General Council on Civic Needs has recommended the construction of a new municipal power house and mechanical building to cost $1,000,000. W. Frank Carter is chairman.

CAVOUR, S. D.—The installation of a municipal electric light plant, to cost about $10,000, is under consideration.

ELLINWOOD, KAN.—Work will soon commence on the installation of an ornamental lighting system in the business district. C. E. Stephen is city clerk.

KANSAS CITY, KAN.—An ornamental lighting system will be installed on streets in the district north and west of Eighteenth and State Streets. R. L. McAlpine is engineer.

LAWRENCE, KAN.—The Kansas Electric Power Company has applied to the Public Utilities Commission for permission to issue $4,975,000 in bonds, the proceeds to be used to purchase the property of the Bowersock Mill & Power Company, Lawrence; the Leavenworth (Kan.) Heat, Light & Power Company and the Bonner Electric & Manufacturing Company and for extensions to its plant at Emporia.

Southern States

JACKSONVILLE, FLA.—H. W. Dexter contemplates the purchase of a 650-kw. generator, or two 300 kw. units, and auxiliary equipment for a local power plant.

CHATTANOOGA, TENN.—The Tennessee Electric Power Company, recently organized to take over and consolidate the Chattanooga Railway & Light Company and the Nashville (Tenn.) Railway & Light Company, has issued $12,150,000 in bonds, part of the proceeds to be used for extensions and improvements.

HUNTSVILLE, ALA.—The Alabama Power Company is planning to extend its transmission lines from Huntsville to the Agricultural and Mechanical College for Negroes at Normal. The company will also supply electricity to residents along the line.

MORRILLTON, ARK.—The installation of an ornamental lighting system in the business district is under consideration by the Council.

AMITE, LA.—The Central Light & Power Company has entered into a contract with the Rathborn Lumber Company, Ponchatoula, whereby it will secure electricity from the latter for distribution in the parish of Tangipahoa. The Central company is establishing a branch plant in Ponchatoula to generate electricity for transmission through Hammond, Natalbany and Independence to Amite City.

EL DORADO, OKLA.—Bids will be received by the Council until June 15 for equipment for a 13,200-volt, three-phase transmission line, triangle construction, between Quanah, Tex., and El Dorado, and for a local distributing system. J. P. DeLoach is clerk.

LOCUST GROVE, OKLA.—Bids will soon be asked for the construction of a transmission line and installation of a local distributing system, to cost about $20,000, for which bonds have been voted. V. V. Long & Company, 1,300 Colcord Building, Oklahoma City, are engineers.

THOMAS, OKLA.—Bonds to the amount of $28,000 have been voted for a municipal electric plant. H. G. Olmstead & Company, Tradesmen's National Bank Building, Oklahoma City, are engineers.

SAN ANTONIO, TEX.—Directors of the Southwestern Insane Asylum have authorized plans prepared for a new power house to cost about $100,000.

Pacific and Mountain States

MUKILTEO, WASH.—The Puget Sound International Railway & Power Company contemplates extending its transmission line from Everett to Mukilteo and installation of a distributing system here.

LOS ANGELES, CAL.—The Lighting and Power Bureau plans the installation of an ornamental lamp system on Melrose Avenue, St. Andrews Place and Gramercy Place.

LOS ANGELES, CAL.—Bids will be received by the Public Service Commission, 207 South Broadway, until June 27, for an electric generator, hydraulic machinery, transformers and auxiliary electrical equipment. James P. Vroman is secretary. (Specification P-262.)

PITTSBURG, CAL.—Plans have been approved for an ornamental lighting system on Black Diamond and Railroad Avenues.

SAN FRANCISCO, CAL.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., is preparing plans for an addition to the power house at the Mare Island Navy Yard. (Specification 4664.)

SAN FRANCISCO, CAL.—The American River Water & Power Company is perfecting plans for the construction of a hydro-electric power plant in Placer County, with total capacity of 200,000 hp., estimated to cost about $15,000,000, including transmission system. Water rights have been secured. Ellery, Frost & Patten, Merchants' National Bank Building, are engineers.

SALT LAKE CITY, UTAH.—The Utah Light & Traction Company has disposed of a bond issue of $12,471,000, a portion of the proceeds to be used for extensions and improvements.

PRESCOTT, ARIZ.—Bids will be received by the Supervising Architect, Treasury Department, Washington, D. C., until June 15 for the installation of a light, power and telephone system at the United States Veterans' Hospital, Whipple Barracks, Prescott.

ROOSEVELT, ARIZ.—The Roosevelt Electrical District, Maricopa County, is arranging a bond issue of $75,000 for the construction of new substations and transmission lines.

CHEYENNE, WYO.—The installation of a new ornamental street-lighting system is under consideration. It is proposed to replace the five-lamp clusters with single lamps.

Canada

COBALT, ONT.—Preparations are being made by the Northern Ontario Light & Power Company to construct a dam at Rabbit Lake, near Femagami. The company also contemplates extending its transmission line from Cobalt to Haileyburg, to cost about $30,000.

OTTAWA, ONT.—The City Council has approved a by-law authorizing an appropriation of $280,000 for extensions and improvements to the hydro-electric plant and electric distribution system. N. H. H. Lett is city clerk.

THESSALON, ONT.—The town officials are considering the construction of a hydro-electric plant at Little Rapids on Thessalon River, to cost about $50,000. The project will include power house, dam, transmission lines, etc.